SPECIFICATIONS FOR MASONRY REPAIRS
GROUP A – PHASE 4, 10, 11, 17, 19 - BUILDING 1
JESSE BROWN VETERANS HOSPITAL
820 S. DAMEN AVE.
CHICAGO, ILLINOIS
September 27, 2013

Frega & Associates Ltd.
411 South Wells Street
Chicago, Illinois 60607
and
WISS, JANNEY, ELSTNER ASSOCIATES, INC.
330 Pfingsten Road
Northbrook, Illinois 60062-2095
(847) 272-7400

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Note: R# is the drawing sheet number, X is the phase number

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01 00 00

JBVAMC SUPPLEMENTAL GENERAL REQUIREMENTS

SECTION 01 00 00

1.01 GENERAL INTENTION

A. Contractor shall furnish labor, materials, equipment & supervision to perform work for "Jesse Brown VA Medical Center" as required by contract documents.

1.02 SCOPE OF WORK

A. Work includes furnishing and installing all work outlined in VA scope of work document for this project.

B. ESTIMATED QUANTITIES OF WORK

Estimated Quantities - Phase XX

Note: Quantities of work listed below are estimates only and are based on a visual examination of the façade from the ground and historical data from repairs of similar facades at Jesse Brown VAMC. Actual repair quantities may vary. Contract agreed upon unit prices shall be used as a basis for payment for original Contract amount or change order requests during course of the work.

Item	Type of Work	Unit	Estimated Quantity
1a.	Remove masonry at corners per detail 6/R4-X	sq. ft	
1b.	Replace masonry at corners per detail 6/R4-X	sq. ft	
2a.	Remove concrete per details 2/R4-X and 3/R4-X	sq. ft	
2b.	Replace concrete per details 2/R4-X and 3/R4-X	sq. ft	
3a.	Remove parapet and coping stone per sheet R7-X	lin. ft	
3b.	Replace parapet and coping stone and integrate with existing roof system per sheet R7-X	lin. ft.	
3c.	Replace section of roofing removed during parapet repair with same by a qualified contractor to maintain warranty (if warranty is still in affect).	lin.ft.	
4.	Cut new vertical expansion joint per 4/R4-X	lin. ft	
5a.	Remove shelf angle including masonry work per detail 1/R6-X	lin. ft	
5b.	Replace new steel shelf angle and flashing including masonry work per detail 1/R6-X	lin. ft	

Item	Type of Work	Unit	Estimated Quantity
6a.	Remove window lintel (steel angle) including masonry work per detail 4/R5-X	lin. ft	
6b.	Replace new window lintel (steel angle) and flashing including masonry work per detail 4/R5-X	lin. ft	
8.	Install exterior wythe of brick masonry	sq. ft	
9a.	Remove limestone panel	sq. ft	
9b.	Replace limestone panel per 3/R8-X	sq. ft	
10.	Install supplemental Helifix anchors per details 1/R8-X, 1/R5-X, and 3/R5-X (location of Helifix anchors will be verified by COR/AE before installation; contractor will provide drawings showing location of intended installation)	Each	
11.	Grind and repoint masonry mortar per details 4/R8-X and 5/R8-X	sq. ft	
12.	Grind and repoint limestone mortar per details 4/R8-X and 6/R8-X	sq. ft	
13.	Remove existing sealant and install new sealant and backer rod at window perimeter per detail 5/R5-X	lin. ft	
14.	Façade cleaning	sq. ft	
15.	Remove and replace damaged limestone window sill	sq. ft	
16.	Seal cracks in window sill	lin. ft	
17.	Remove Jesse Brown VA Hospital sign; relocate on roof, securely position to be observed from street level; replace sign once masonry repair work is completed	Sign	
18.	Roof membrane removal and replacement at parapet	sq. ft	

Note: All quantities of repairs for each item are estimated based. Actual quantities of work may vary. An increase in quantities shall be brought to the COR immediately before work proceeds.

Note: R# is the drawing sheet number, X is the phase number

1.03 WORK PROCEDURES, CORRESPONDENCE, PAY REQUEST FORMAT ETC.

A. Develop the construction procedures and use construction materials to meet or exceed the requirements established in Green Environmental Management Systems (GEMS), Federal ordinance # EO 13148.

B. Use of Service Elevators for hauling Construction materials is not permitted thru Hospital elevators.

C. Hoisting of materials with Crane Lift shall be permitted on weekends or after-hours (before 7AM or after 4:30 PM) only at no additional cost to VA.

D. All correspondence regarding change order proposals, daily log, product submittals, RFI, pay requests, payroll documents, invoices, meeting minutes, safety plan, survey reports to be sent to VA electronically in WORD and/or EXCEL format .

E. All windows (including frames) shall be covered & uncovered , in stages with plastics and tape as work progresses to prevent penetration of dust inside Hospital

F. Contractor to submit a pencil copy of monthly progress payment to Contracting Officer and COR for review before submitting to VA central payment processing center. A sample of EXCEL spreadsheet to be attached to each pay application pencil copy is shown below

		Project name : Masonry Repairs Grp A Ph 4, 10, 11, 17, 19					Project # 537-14-101					
		Contract or name										
		Invoice No.			Billing Period					Billing date		
				Demolition				New Work				
Item #	**Item Description**	**Unit**	**Unit Cost per schedule of value**	**Quantity of demo to date**	**Quantity of demo, this invoice**	**Rate (inc. OH & P)**	**Sub-total Amount**	**Quantity of New work to date**	**Quantity of New work in this inv**	**Rate (inc. OH & P)**	**Sub-total Amount**	**Total amount**

1.04 FIRE & LIFE SAFETY

A. Applicable Publications: Publications listed below form part of this Article to extent referenced. Publications are referenced in text by basic designations only.

1. American Society for Testing and Materials (ASTM)
   E84-1998 ..... Surface Burning Characteristics of Building Material
2. National Fire Protection Association (NFPA):
   10-1998..... Standard for Portable Fire Extinguishers
   FCLCH-30-1996 ..... Flammable and Combustible Liquids Code
   51B-1999 ..... Standard for Fire Prevention during Welding, Cutting and Other Hot Work
   70-1999..... National Electrical Code
   241-1996..... Standard for Safeguarding Construction, Alteration, and Demolition Operations
3. Occupational Safety and Health Administration (OSHA)
   29 CFR 1926 ..... Safety and Health Regulations for Construction

A. Fire Safety Plan: Establish and maintain a fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submits to COR and Facility Safety Manager /Officer for review for compliance.

B. Site and Building Access: Maintain free and unobstructed access to facility emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.

C. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately under construction, and temporarily for connections. Provide fire watch for impairments more than 4 hours in a 24-hour period. Request interruptions in accordance with Article, OPERATIONS AND STORAGE AREAS, and coordinate with Project Engineer and facility Safety Manager.

D. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with Project Engineer (COR) and Facility Safety Officer.

E. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Submit Hot Work Permit (on VA form) at least three days in advance.

F. Fire Hazard Prevention & Inspections: Provide Fire Extinguishers thru-out construction site to meet NFPA10 code requirements. A layout of the location and type of these Fire Extinguishers is required to be prepared by the contractor for VA approval at the start of construction. During construction period, contractor to inspect these fire-extinguishers on a monthly basis and maintain a record of these inspections for COR review. Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to COR and facility Safety Manager.

G. Smoking: Smoking is prohibited in and adjacent to construction areas inside existing buildings and additions under construction. In separate and detached buildings under construction, smoking is prohibited except in designated smoking rest areas.

H. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily. Hauling demolished materials thru JB Elevators is not permitted.

I. Perform other construction, alteration and demolition operations in accordance with 29 CFR 1926.

J. Working space and space available for storing materials shall be as determined by the Project Engineer (COR).

K. Workmen are subject to rules of Medical Center applicable to their conduct.

L. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others.

1. Do not store materials and equipment in other than assigned areas.
2. Schedule delivery of materials and equipment to immediate construction working areas within buildings in use by Department of Veterans Affairs.
3. Any replacement of existing engineering systems (HVAC units, sprinklers, fire alarm devices, safety devices, electric panels etc.) which is serving existing occupied areas and is also a part a part of the project, shall be completed on a priority basis and will be immediately turned over to VA and accepted by COR for its gainful use and management control. Any access to this system will be upon approval from COR.
4. Any penetration of an existing smoke wall or firewall shall be fire sealed within 48 hours of making the penetration. Noncompliance will be serious fire safety violation.

M. Building(s) will be occupied during performance of work.

N. Training of Contractor and Subcontractor personnel: All onsite personnel of General Contractor and their sub-contractor's construction workers are required to have completed the OSHA 10-hour construction worker course, the 30-hour construction course, or other relevant competency training, as determined by the VA.

O. Security of Construction Areas: The Contractor shall ensure that all work area doors are secured/locked during and after work hours?

P. All work, including scaffolding installation, lifelines, electrical connections, shall be per applicable OSHA, NFPA, National Electrical Code Association (NECA) codes. Contractor shall submit submittals for installing scaffolds, lifelines, electrical lines to operate equipment & scaffold, protection of existing equipment & structures for VA review and approval.

1.05 ALTERATIONS

A. Survey: Before any work is started, the Contractor shall make a thorough survey with the Project Engineer of areas of buildings in which alterations occur and areas which are anticipated routes of access, and furnish a report, signed by both, to the Contracting Officer. This report shall list by rooms and spaces:

1. Existing condition and types of resilient flooring, doors, windows, walls and other surfaces not required to be altered throughout affected areas of building.
2. Existence and conditions of items such as plumbing fixtures and accessories, electrical fixtures, equipment, venetian blinds, shades, etc., required by drawings to be either reused or relocated, or both.
3. Shall note any discrepancies between drawings and existing conditions at site.
4. Shall designate areas for working space, materials storage and routes of access to areas within buildings where alterations occur and which have been agreed upon by Contractor and the Project Engineer (COR)
5. Any items required by specification to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of the Project Engineer (COR) to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor with new items in accordance with specifications, which will be furnished by Government. Provided the contract work is changed by reason of this

subparagraph 5, the contract will be modified accordingly, under provisions of clause entitled "DIFFERING SITE CONDITIONS" (FAR 52.236-2) and "CHANGES" (FAR 52.243-4 and VAAR 852.236-88) of Section 01001, GENERAL CONDITIONS.

B. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and Project Engineer (COR) together shall make a thorough re-survey of the areas of buildings involved. They shall furnish a report on conditions then existing, of resilient flooring, doors, windows, walls and other surfaces as compared with conditions of same as noted in first condition survey report.
   1. Re-survey report shall also list any damage caused by Contractor to such flooring and other surfaces, despite protection measures; and, will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workmen in executing work of this contract.

C. Protection: Provide the following protective measures:
   1. Protection of interior of existing structures at all times, from damage, dust and weather inclemency. Wherever work is performed, floor surfaces that are to remain in place shall be adequately protected prior to starting work, and this protection shall be maintained intact until all work in the area is completed.
   2. For construction in any areas that will remain jointly occupied by the medical Center and Contractor’s workers, the Contractor shall:
      a. Provide plastic barriers to completely separate construction from the operational areas of the hospital in order to contain dirt debris and dust.
      b. Broom clean and wet mop at the end of each workday. Remove debris as they are created. Transport these outside the construction area in containers with tightly fitting lids.

1.06 PROTECTION OF EXISTING STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS

A. The Contractor shall preserve and protect all structures and equipment on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract.

B. The Contractor shall protect from damage all existing improvements and utilities at or near the work site and on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

1.07 RESTORATION

A. Remove, cut, alter, replace, patch and repair existing work as necessary to install new work. Except as otherwise shown or specified, do not cut, alter or remove any structural work, and do not disturb any ducts, plumbing, steam, gas, or electric work without approval of the Project Engineer (COR). Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the Project Engineer (COR) before it is disturbed. Materials and workmanship used in

restoring work shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.

B. Upon completion of contract, deliver work complete and undamaged. Existing work (walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, walks, etc.) disturbed or removed as a result of performing required new work, shall be patched, repaired, reinstalled, or replaced with new work, and refinished and left in as good condition as existed before commencing work.

C. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workmen to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone) which are indicated on drawings and which are not scheduled for discontinuance or abandonment

1.08 AS-BUILT DRAWINGS

A. The contractor shall maintain two full size sets of as-built drawings, which will be kept current during construction of the project, to include all contract changes, modifications and clarifications.

B. All variations shall be shown in the same general detail as used in the contract drawings. To insure compliance, as-built drawings shall be made available for the Project Engineer's (COR) review, as often as requested.

C. Contractor shall deliver two, full size, completed sets of as-built drawings, including 1 set on AUTOCAD, to the Project Engineer (COR) within 15 calendar days after each completed phase and after the acceptance of the project by the Resident Engineer.

D. Contractor shall complete information in standard VA forms for all building service equipment installed in the project which requires preventive maintenance by VA personnel.

1.09 INSTRUCTIONS

A. Contractor shall furnish Maintenance and Operating manuals and verbal instructions when required by the various sections of the specifications and as hereinafter specified.

B. Manuals: Maintenance and operating manuals (four copies each) for each separate piece of equipment shall be delivered to the Project Engineer (COR) coincidental with the delivery of the equipment to the job site. Manuals shall be complete, detailed guides for the maintenance and operation of equipment. They shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and sub-assembly components. Manuals shall include an index covering all component parts clearly cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" views showing and identifying each separate item. Emphasis shall be placed on the use of special tools and instruments. The function of each piece of equipment, component, accessory and control shall be clearly and thoroughly explained. All necessary precautions for the operation of the equipment and the reason for each precaution shall be clearly set forth. Manuals must reference the exact model, style and size of the piece of equipment and system being furnished. Manuals

referencing equipment similar to but of a different model, style, and size than that furnished will not be accepted.

C. Instructions: Contractor shall provide qualified, factory trained manufacturers' representatives to give detailed instructions to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be at the job site. These requirements are more specifically detailed in the various technical sections. Instructions for different items of equipment that are component parts of a complete system shall be given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All instruction periods shall be at such times as scheduled by the Project Engineer (COR) and shall be considered concluded only when the Project Engineer (COR) is satisfied in regard to complete and thorough coverage. The Department of Veterans Affairs reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the Project Engineer (COR), does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

D. Waxing on VCT tile flooring will be done by VA (EMS dept.), and not by the contractor.

E. All highlighted/ marked VA Standard Specification Sections are incorporated as part of the solicitation or contract by reference.

1.10 NOISE & VIBRATION CONTROL

A. Noise levels, due to construction work activities shall be less than 75 decibels throughout construction. Vibrations levels shall be below Industry Standards for working in Hospital Environment

B. If Hospital operations (Patient care, staff work etc.) are affected and/or interrupted due to noise and/or vibrations, Contractor shall perform construction after 5:00 pm to 6:00 am and/or on weekends (when hospital operations are not affected) at no additional cost to VA.

2 WEEK ROLL FOR CONSTRUCTION ACTIVITIES PROJECT_____

	TASK	Day of Week	Noise*	Dust	Vibrations	Fire Exit Mod.	Fire Separation Mod.	Odor	SHUTDOWN REQUESTS						
									Sprinkler	Chilled Water	Steam	Water	Fire Alarm Sys.		
1st. Wk. XX/XX/XX thru XX/XX/XX															
2nd. Wk. XX/XX/XX thru XX/XX/XX															

Comments: *= sound level above 55 db.

END OF SECTION

SECTION 01 20 00

PROJECT MEETINGS

PART 1 - GENERAL

1.01 SUMMARY

A. COR: Schedule progress meetings.

1. VA Architect/Engineer will provide an agenda to VA
2. VA Architect/Engineer shall record and submit meeting minutes and work progress report to VA

1.02 PRECONSTRUCTION MEETING

A. VA shall schedule per contract requirements.

B. Attendance: Contractor, Subcontractors, Architect/Engineer, Engineering Consultants, and Owner's representative.

C. Agenda to Include: as specified by VA Contracting Officer

1.03 PROGRESS MEETINGS

A. Hold regular weekly and called meetings as progress of work dictates.

B. Location of Meetings: VA shall specify.

C. Attendance: VA, VA-AE, Contractor, Subcontractors as pertinent to agenda.

D. Minimum Agenda:

1. Review work progress since last meeting.
2. Note field observations, problems and decisions.
3. Identify problems, which impede planned progress.
4. Develop corrective measures and procedures to regain schedule.
5. Review submittal schedules; expedite as required to maintain schedule.

END OF SECTION

SECTION 01 42 19

REFERENCE STANDARDS

PART 1 - GENERAL

1.01 DESCRIPTION

This section specifies the availability and source of references and standards specified in the project manual under paragraphs APPLICABLE PUBLICATIONS and/or shown on the drawings.

1.02 AVAILABILITY OF SPECIFICATIONS LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS FPMR PART 101-29 (FAR 52.211-1) (AUG 1998)

A. The GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, FPMR Part 101-29 and copies of specifications, standards, and commercial item descriptions cited in the solicitation may be obtained for a fee by submitting a request to – GSA Federal Supply Service, Specifications Section, Suite 8100, 470 East L'Enfant Plaza, SW, Washington, DC 20407, Telephone (202) 619-8925, Facsimile (202) 619-8978.

B. If the General Services Administration, Department of Agriculture, or Department of Veterans Affairs issued this solicitation, a single copy of specifications, standards, and commercial item descriptions cited in this solicitation may be obtained free of charge by submitting a request to the addressee in paragraph (a) of this provision. Additional copies will be issued for a fee.

1.03 AVAILABILITY FOR EXAMINATION OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-4) (JUN 1988)

The specifications and standards cited in this solicitation can be examined at the following location:

DEPARMENT OF VETERANS AFFAIRS
Office of Construction & Facilities Management
Facilities Quality Service (00CFM1A)
425 Eye Street N.W, (sixth floor)
Washington, DC 20001
Telephone Numbers: (202) 632-5249 or (202) 632-5178
between 9:00 AM - 3:00 PM

1.04 AVAILABILITY OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-3) (JUN 1988)

The specifications cited in this solicitation may be obtained from the associations or organizations listed below.

AA Aluminum Association Inc.
http://www.aluminum.org

AABC	Associated Air Balance Council http://www.aabchq.com
AAMA	American Architectural Manufacturer's Association http://www.aamanet.org
AAN	American Nursery and Landscape Association http://www.anla.org
AASHTO	American Association of State Highway and Transportation Officials http://www.aashto.org
AATCC	American Association of Textile Chemists and Colorists http://www.aatcc.org
ACGIH	American Conference of Governmental Industrial Hygienists http://www.acgih.org
ACI	American Concrete Institute http://www.aci-int.net
ACPA	American Concrete Pipe Association http://www.concrete-pipe.org
ACPPA	American Concrete Pressure Pipe Association http://www.acppa.org
ADC	Air Diffusion Council http://flexibleduct.org
AGA	American Gas Association http://www.aga.org
AGC	Associated General Contractors of America http://www.agc.org
AGMA	American Gear Manufacturers Association, Inc. http://www.agma.org
AHAM	Association of Home Appliance Manufacturers http://www.aham.org
AISC	American Institute of Steel Construction http://www.aisc.org
AISI	American Iron and Steel Institute http://www.steel.org
AITC	American Institute of Timber Construction http://www.aitc-glulam.org

AMCA	Air Movement and Control Association, Inc. http://www.amca.org
ANLA	American Nursery & Landscape Association http://www.anla.org
ANSI	American National Standards Institute, Inc. http://www.ansi.org
APA	The Engineered Wood Association http://www.apawood.org
ARI	Air-Conditioning and Refrigeration Institute http://www.ari.org
ASAE	American Society of Agricultural Engineers http://www.asae.org
ASCE	American Society of Civil Engineers http://www.asce.org
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers http://www.ashrae.org
ASME	American Society of Mechanical Engineers http://www.asme.org
ASSE	American Society of Sanitary Engineering http://www.asse-plumbing.org
ASTM	American Society for Testing and Materials http://www.astm.org
AWI	Architectural Woodwork Institute http://www.awinet.org
AWS	American Welding Society http://www.aws.org
AWWA	American Water Works Association http://www.awwa.org
BHMA	Builders Hardware Manufacturers Association http://www.buildershardware.com
BIA	Brick Institute of America http://www.bia.org

CAGI Compressed Air and Gas Institute
http://www.cagi.org

CGA Compressed Gas Association, Inc.
http://www.cganet.com

CI The Chlorine Institute, Inc.
http://www.chlorineinstitute.org

CISCA Ceilings and Interior Systems Construction Association
http://www.cisca.org

CISPI Cast Iron Soil Pipe Institute
http://www.cispi.org

CLFMI Chain Link Fence Manufacturers Institute
http://www.chainlinkinfo.org

CPMB Concrete Plant Manufacturers Bureau
http://www.cpmb.org

CRA California Redwood Association
http://www.calredwood.org

CRSI Concrete Reinforcing Steel Institute
http://www.crsi.org

CTICooling Technology Institute
http://www.cti.org

DHI Door and Hardware Institute
http://www.dhi.org

EGSA Electrical Generating Systems Association
http://www.egsa.org

EEIEdison Electric Institute
http://www.eei.org

EPA Environmental Protection Agency
http://www.epa.gov

ETL ETL Testing Laboratories, Inc.
http://www.et1.com

FAA Federal Aviation Administration
http://www.faa.gov

FCC Federal Communications Commission
http://www.fcc.gov

FPS	The Forest Products Society http://www.forestprod.org
GANA	Glass Association of North America http://www.cssinfo.com/info/gana.html/
FM	Factory Mutual Insurance http://www.fmglobal.com
GA	Gypsum Association http://www.gypsum.org
GSA	General Services Administration http://www.gsa.gov
HI	Hydraulic Institute http://www.pumps.org
HPVA	Hardwood Plywood & Veneer Association http://www.hpva.org
ICBO	International Conference of Building Officials http://www.icbo.org
ICEA	Insulated Cable Engineers Association Inc. http://www.icea.net
\ICAC	Institute of Clean Air Companies http://www.icac.com
IEEE	Institute of Electrical and Electronics Engineers http://www.ieee.org\
IMSA	International Municipal Signal Association http://www.imsasafety.org
IPCEA	Insulated Power Cable Engineers Association
NBMA	Metal Buildings Manufacturers Association http://www.mbma.com
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry Inc. http://www.mss-hq.com
NAAMM	National Association of Architectural Metal Manufacturers http://www.naamm.org
NAPHCC	Plumbing-Heating-Cooling Contractors Association http://www.phccweb.org.org

NBS National Bureau of Standards
See - NIST

NBBPVI National Board of Boiler and Pressure Vessel Inspectors
http://www.nationboard.org

NEC National Electric Code
See - NFPA National Fire Protection Association

NEMA National Electrical Manufacturers Association
http://www.nema.org

NFPA National Fire Protection Association
http://www.nfpa.org

NHLA National Hardwood Lumber Association
http://www.natlhardwood.org

NIH National Institute of Health
http://www.nih.gov

NIST National Institute of Standards and Technology
http://www.nist.gov

NLMA Northeastern Lumber Manufacturers Association, Inc.
http://www.nelma.org

NPA National Particleboard Association
18928 Premiere Court
Gaithersburg, MD 20879
(301) 670-0604

NSF National Sanitation Foundation
http://www.nsf.org

NWWDA Window and Door Manufacturers Association
http://www.nwwda.org

OSHA Occupational Safety and Health Administration
Department of Labor
http://www.osha.gov

PCA Portland Cement Association
http://www.portcement.org

PCI Precast Prestressed Concrete Institute
http://www.pci.org

PPI The Plastic Pipe Institute
http://www.plasticpipe.org

PEI Porcelain Enamel Institute, Inc.
http://www.porcelainenamel.com

PTI Post-Tensioning Institute
http://www.post-tensioning.org

RFCI The Resilient Floor Covering Institute
http://www.rfci.com

RIS Redwood Inspection Service
See - CRA

RMA Rubber Manufacturers Association, Inc.
http://www.rma.org

SCMA Southern Cypress Manufacturers Association
http://www.cypressinfo.org

SDI Steel Door Institute
http://www.steeldoor.org

IGMA Insulating Glass Manufacturers Alliance
http://www.igmaonline.org

SJI Steel Joist Institute
http://www.steeljoist.org

SMACNA Sheet Metal and Air-Conditioning Contractors
National Association, Inc.
http://www.smacna.org

SSPC The Society for Protective Coatings
http://www.sspc.org

STI Steel Tank Institute
http://www.steeltank.com

SWI Steel Window Institute
http://www.steelwindows.com

TCA Tile Council of America, Inc.
http://www.tileusa.com

TEMA Tubular Exchange Manufacturers Association
http://www.tema.org

TPI Truss Plate Institute, Inc.
583 D'Onofrio Drive; Suite 200
Madison, WI 53719
(608) 833-5900

UBC	The Uniform Building Code See ICBO
UL	Underwriters' Laboratories Incorporated http://www.ul.com
ULC	Underwriters' Laboratories of Canada http://www.ulc.ca
WCLIB	West Coast Lumber Inspection Bureau 6980 SW Varns Road, P.O. Box 23145 Portland, OR 97223 (503) 639-0651
WRCLA	Western Red Cedar Lumber Association P.O. Box 120786 New Brighton, MN 55112 (612) 633-4334
WWPA	Western Wood Products Association http://www.wwpa.org

END OF SECTION

SECTION 01 50 00

MOCK-UP

PART 1 - GENERAL

1.01 DESCRIPTION

A. Furnish all labor, materials, tools and equipment and perform all Work necessary for and incidental to constructing the field mock-ups of the Work. The mock-ups are to be on building and, when approved, will be part of work. This is to include:

Parapet installation and integration with existing roofing. Minimum of 3 feet
Shelf angle and flashing installation. Minimum of 3 feet.
Each supplemental anchor installation. Minimum of one per each back-up condition
Perform three trial sample of brick masonry and three samples of limestone for each cleaning procedure specified (total of eighteen trial sample cleanings). Minimum of 25 square feet per sample.

B. The purpose of the mock-up is to provide the Contractor, Owner, and Owner's Representative with a unified understanding of the type and quality of Work that will be necessary to satisfy the requirements of the entire project.

C. Related Sections:

1. All Sections in Divisions 0 through 26 will apply.

1.02 CONTRACTOR'S RESPONSIBILITIES

A. Secure and deliver adequate quantities of representational samples of materials proposed to be used and which require testing.

B. Furnish copies of products test reports as required.

C. Furnish incidental labor and facilities:

PART 2 - PRODUCTS

2.01 MATERIALS

A. Include all materials specified for this project in the Specification Sections.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Field mock-up shall be representative of the finished work in every respect and shall be judged by the Owner and Owner's Representative for aesthetic acceptability. Unsatisfactory work shall be replaced as directed.

B. If in the course of erecting, and inspecting the mock-up, changes are required to satisfy the project requirements or existing conditions, substitutions shall be made in accordance with the contract.

C. All concealed portions of the mock-up shall be inspected by the Owner's Representative and, if approved, photographed for future reference prior to the finish material being installed.

D. When completed, and accepted by the Owner's Representative and Owner, the mock-up shall become the standard of quality for the remainder of the project.

END OF SECTION

SECTION 01 53 23

SUBMITTALS (SHOP DRAWINGS, PRODUCT DATA AND SAMPLES)

PART 1 - GENERAL

1.01 SUMMARY

Work includes submission of shop drawings, product data and samples to VA-COR as required by Specification Sections and as specified herein.

LIST OF SUBMITTALS (BUT NOT LIMITED TO) ITEMS FOR VA REVIEW AND APPROVAL IS AS FOLLOWS;

- Main electrical feed line from inside Hospital to work area.
- Life line anchor and location details per scaffold drop.
- Attaching scaffold to existing structures.
- Type and scaffold details.
- Bricks
- Mortar
- Sealant
- Helifix steel anchors.
- Steel angles.
- Window lintels and sills
- Limestone.
- Life safety plan
- Protection of existing equipment & structures.

1.02 DEFINITIONS

A. Shop Drawings: Shop Drawings are original drawings prepared by Contractor, Subcontractor, Sub-subcontractor, Supplier or Distributor, which illustrate some portion of the Work; showing fabrication, layout, setting or erection details.

1. Prepared by qualified detailer.
2. Identify details by reference to sheet and detail numbers on Contract Drawings.
3. Minimum sheet size: 8 1/2 in. x 11 in.

B. Project Data:
1. Manufacturer's standard schematic drawings:
   a. Modify to delete information, which is not applicable to project.
   b. Supplement standard information to provide additional information applicable to project.
2. Manufacturers' catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.
   a. Clearly mark each copy to identify pertinent materials, products or models.

b. Show dimensions and clearances required.
c. Shop performance characteristics and capacities.

3. Physical samples to illustrate materials, equipment or workmanship, and to establish standards by which complete work is judged.
4. Office samples: Of sufficient size to clearly illustrate:

a. Functional characteristics of product or materials, with integrally related parts and attachment devices.
b. Full range of color samples.

5. Field samples and mock-ups, when shown on the Drawings or specified in a particular Section:
a. Erect at Project site at location acceptable to VA-COR.
b. Construct each sample or mock-up complete, including work of all trades required in finished work.
c. Remove as directed.

1.03 SPECIFIED PRODUCTS LIST

A. Submit to the VA-COR 3 copies of complete list of all products, which are proposed for installation within 30 days from NTP

B. Tabulate list of each Specification Section.

C. For products specified under reference standards, include with listing of each product:
1. Name and address of manufacturer
2. Trade name
3. Model or catalog designation
4. Manufacturer's data including performance and test data and reference standards.

1.04 EXHIBIT SUBMITTAL REQUIREMENTS

A. At time specified submit schedule of all required exhibits to Architect/Engineer.
1. Schedule shall include:
a. Exhibit identification by specification section and page number
b. Date of submittal to Architect/Engineer
c. Latest date for final approval
d. Time required for fabrication
e. Date of installation
2. Contractor will coordinate exhibits with master project schedule, prepare master exhibit schedule and submit it to Architect/Engineer for review.

B. Submit the quantity of documents required for return plus three (3) copies of opaque prints of shop drawings and product data; two (2) copies will be retained by Architect/Engineer and one copy will be forwarded to the field observer's office.

C. Submit samples in duplicate, unless otherwise specified.

D. Accompany submittals with transmittal letter, in duplicate, containing:
1. Date

2. Project title and number
3. Contractor's name and address
4. The number of each shop drawing, product data and sample submitted
5. Notification of deviations from Contract

E. The Architect/Engineer will check and review, with reasonable promptness, schedules and drawings only for conformance with the design concept of the project and compliance with the information given in the Contract Documents. The revised copies will be returned to the Contractor and any further distribution required will be the responsibility of the Contractor.

F. Samples shall be sufficient size to show general visual effect. When samples must show range of color, texture, finish, graining, or other properties, submit in sets of three showing the full scope of this range. Each sample shall bear identifying labels stating project name, material, manufacturer, and location on project. Each sample or set of samples shall be accompanied by a transmittal.

G. Samples will be reviewed and the Contractor notified in writing if the sample conforms to the design concept and requirements of the Contract Documents.

H. Samples will be retained by the Architect/Engineer and will serve as the standard by which all material delivered to the job will be judged.

I. Certain samples may be incorporated into the Work when approved by the Architect/Engineer or may be retrieved by the Contractor at the completion of the Work where so stated in the Specifications.

J. Samples will be reviewed for conformance with the design intent only. Conformance to all requirements of the Contract Documents remains the responsibility of the Contractor.

K. Submittals shall include:
1. Date and revision dates
2. Project title and number
3. Names of:
    a. Architect/Engineer
    b. Architect's consultants, as applicable
    c. Construction manager, as applicable
    d. Subcontractor
    e. Sub-subcontractor, as applicable
    f. Supplier
    g. Manufacturer
    h. Separate detailer, when pertinent.
4. Identification of product or material.
5. Relation to adjacent structure or material.
6. Field dimensions, clearly identified as such.
7. Specification Section and page number.
8. Applicable Standards, such as ASTM number or Federal Specification.
9. A blank space 3-in. x 3 in., for Architect/Engineer's stamp.
10. Identification of deviation(s) from Contract Documents.
11. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements and compliance with Contract.

1.05 RESUBMISSION REQUIREMENTS

A. Shop Drawings:
   1. Revise initial drawings as required and resubmit as specified for initial submittal.
   2. Indicate on drawings all changes, which have been made other than those, requested by VA.
   3. In the event the submittal is returned stamped "AMEND AND RESUBMIT" or "REJECTED - SEE REMARKS", a revised submittal of the shop drawings shall be resubmitted to the VA for review as above.
   4. Drawings received by the VA which do not bear the Contractor's stamp of approval or contain numerous errors indicating a superficial check on the part of the Contractor will be returned for resubmission and will not be reviewed by the VA. The VA review of drawings or schedules shall not relieve the Contractor of the responsibility for deviations from the Contract Documents, unless he has in writing called the VA attention to such deviations at the time of submission and secured his written approval, nor shall it relieve him of responsibility for errors of any kind.
   5. Shop drawings stamped "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS INDICATED" and bearing the VA signature shall be kept at the jobsite and the Architect/Engineer will order the removal of any not so noted.

B. Product Data and Samples: Submit new data and samples as required for initial submittal.

C. Make all submittals so as not to delay work. No extension of contract will be allowed for delays due to improper submittals.

1.06 DISTRIBUTION OF SUBMITTALS AFTER REVIEW

A. Distribute copies of shop drawings and project data which carry Architect/Engineer's stamp to:
   1. Contractor's file
   2. Job site file
   3. Record documents file
   4. Other Contractors
   5. Subcontractors
   6. Suppliers
   7. Fabricators

B. Distribute samples as directed in accordance with Contract Documents.

1.07 CONTRACTOR RESPONSIBILITIES

A. Review shop drawings, product data and samples prior to submission.

B. Verify:
   1. Field dimensions
   2. Field construction criteria
   3. Catalog numbers and similar data

C. Coordinate each submittal with requirements of:
   1. The Work
   2. The Contract Documents
   3. The Work of other Contractors

D. Contractor's responsibility for errors and omissions in submittals is not relieved by VA review of submittals.
E. Notify VA, in writing at time of submissions, of deviations in submittals from Contract requirements.
F. Contractor's responsibility for deviations in submittals from Contract Document requirements is not relieved by VA review of submittals.
G. Do not begin any work that requires submittals without having VA stamp and initials or signature indicating approval.
H. After VA-Architect/Engineer review, make response required by VA-Architect/Engineer's stamp and distribute copies.

1.08 VA-ARCHITECT/ENGINEER'S DUTIES

A. Review submittals with reasonable promptness.
B. Review for:
   1. Design concept of Project
   2. Information given in Contract Documents

C. Review of separate item does not constitute review of an assembly in which item functions.
D. Affix stamp, date and initials or signature certifying to review of submittal, and with instructions for Contractor response, as needed.
E. Return submittals to Contractor for response or distribution.

END OF SECTION

SECTION 01 57 19

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

A. The Contractor shall be responsible for arranging for and providing all construction facilities and temporary controls as specified herein and as required for the proper and expeditious prosecution of the Work. The Contractor shall pay all costs for such facilities and controls unless otherwise specified, until date of substantial completion of Project.

B. Construction operations at the building site shall be in accordance with "The Manual for Accident Prevention" (AGC) and shall be subject to all applicable laws, governmental rules and regulations.

1.02 TEMPORARY ELECTRICITY

A. The Contractor can use the existing electrical in the building provided circuits are not shared or will not interfere with the operation of the building. If not, the Contractor shall provide his own power distribution connected to the building electrical supply. Terminations shall be provided for each voltage supply complete with circuit breakers; disconnect switches and other devices as required to protect the existing power supply system. Convenience outlets for fractional horsepower tools such as saws, drills, etc., and extension cords shall be located at convenient points in each working area in such quantity as to permit 50-ft maximum extension cords to be used.

B. All temporary equipment and wiring for power and lighting shall be in accordance with the applicable provisions of the governing codes. All temporary wiring shall be maintained in a safe manner and utilized so as not to be a hazard to persons or property.

C. At the completion of the construction work all temporary wiring; the Contractor shall remove lighting and other temporary electrical equipment and devices.

D. If parts of the permanent electrical systems are used, the Contractor must: (1) obtain approval of the Owner; (2) assume full responsibility for systems used, including cleaning and restoration, and (3) remove all temporary facilities upon completion.

1.03 TEMPORARY FIRE PROTECTION

A. The Jesse Brown Veterans hospital is a “NO SMOKING” building. The Contractor shall prohibit all lighting of fires about the premises and all smoking in restricted areas (elevators, lobby, corridors, stairwells, penthouses, and all other spaces) and shall use due diligence to see that such prohibition is enforced. "NO SMOKING" signs shall be furnished and posted by the Contractor.

B. No debris or waste materials shall be burned at the construction site.

C. It shall be the responsibility of the Subcontractor to notify the General Contractor in advance of the work when welding or other fire hazardous work is to be performed so that proper precautionary measures may be taken to prevent fire.

D. Stove heaters in temporary offices and sheds shall be properly installed to protect combustible walls, floors and roof.

E. Salamander heaters or similar forms of uncontrollable heaters shall not be used except with the special permission of the Owner and then only when each salamander is maintained under constant supervision.

F. Gasoline shall be kept and handled in approved safety cans.

G. All tarpaulins used for any purpose shall be made of fire, water and weather-resistant duck.

1.04 CONSTRUCTION AIDS

A. The Contractor shall provide all temporary ladders, ramps, runways stairs, scaffolding, staging, temporary enclosures, hoists, rubbish chutes, etc., as may be required for performance of the Work.

B. All construction aids shall comply with federal, state and local laws and regulation.

C. Temporary Enclosures:

1. Temporary weather tight enclosures and temporary heating shall be provided by the Contractor as required during construction to make the building weather tight and insulated to protect the work from frost damage, and as necessary to ensure suitable working conditions for the construction operations of all trades. In areas of the building where work is being conducted, the temperature shall be maintained as specified in various Sections of the Specifications but not less than 45°F. Temporary enclosures shall remain in place until the Work is substantially enclosed by permanent construction.
2. If the permanent walls and windows are used, as temporary enclosures, they shall be protected at all times against damage and thoroughly cleaned upon completion. Any damaged parts, including glass, shall be satisfactorily repaired or replaced and left in perfect condition. Temporary doors shall be of wood construction and shall be hinged, self-closing and locked.
3. The Work or any major portion thereof, shall be considered substantially enclosed when, in the opinion of the Architect/Engineer, it has reached the stage where all contiguous exterior walls have been completed, all exterior openings closed up by the permanent walls, glazed windows and doors, or by adequate and approved temporary window and door closures, and the Work is ready for interior finishing operations.

D. Temporary Hoists:

1. The Contractor shall provide, maintain and operate material hoists as required. Hoists shall be mechanized and electrically powered. Construction maintenance and operation shall be in accordance with authorities having jurisdiction and the recommendations of the Manual of Accident Prevention in Construction of the Associated General Contractors of America.
2. Hoists shall be constructed at such locations as will not interfere with the progress of the Work. They shall be located a sufficient distance from exterior walls and be so protected as to prevent damage, staining or marring the permanent Work.
3. Each hoist platform shall be equipped with counterbalanced sliding gates and wire mesh protection on all sides. Roof over platform as a protection against falling materials or debris.
4. Hoist capacities, and scheduling of operation shall be adequate for use of all Contractors and Subcontractors and shall be made available to them during normal working hours without cost.

E. Temporary Rubbish Chutes:

1. The Contractor shall construct and maintain dustproof rubbish chutes, as required. The chutes shall be erected on the outside of the structure, at a location approved by the Owner. The chutes shall be maintained and left in place until the need for chutes no longer exists, and shall be removed when directed by the Owner. The chutes shall discharge into trucks or suitable containers so as to avoid rehandling. The Contractor shall remove the rubbish from the site. The Contractor shall spray the rubbish as required to prevent dust nuisance. The rubbish chutes shall be usable by Subcontractors and in the event of separate contracts by all other Contractors without charge.

1.05 SPECIAL CONTROLS

A. Sanitary sewers: The Contractor shall not permit debris, or other contaminants that are deleterious to the sanitary sewer system in the building, or the City's sewer system, to be washed down drains.

B. Debris control: The Contractor shall plan and take all necessary steps to develop to prevent injury to the public, damage to the building and damage to adjacent buildings from falling debris. Unless specifically instructed by VA, specific requirements are discussed below:

1. A protective canopy shall be installed around the perimeter of the base of the building where required to protect existing oxygen tank and pedestrians that are walking around or near the building from falling concrete and debris during the entire course of the repair work. The erection of this canopy may be staged to correspond with the staging of the repair work. This canopy shall include, at a minimum, a 4-ft high protective screen fence along the outside edge of the top of the canopy to prevent debris from bouncing off of the top of the canopy. The canopy shall be construction so as to protect pedestrians and vehicles.

   This protective canopy shall be constructed of standard heavy-duty pipe scaffolding members. All aspects of the canopy shall be secured to prevent damage or uplift during high wind conditions. The design and erection of this canopy shall comply with the current local building code, ordinances and building departmental requirements.

2. The Contractor shall be fully responsible for any and all injuries and property damage that occurs due to debris falling from the building or the scaffolding work platforms during the entire course of the project. Any damage to private property of the Owner and the employees or their guests from falling debris shall be repaired or compensated to the satisfaction of the Owner, by the Contractor, at no cost to the Owner or the employees.

1.06 TEMPORARY CONTROLS AND DUST CONTROL

A. The Contractor shall conform to the requirements of federal, state and local codes and authorities with regard to noise, dust, pest and pollution control.

B. The control of construction dust generated in the course of the work is the responsibility of the Contractor. Temporary partitions shall be constructed as required to control dust. Filters shall be installed on air intakes. The Contractor shall store his materials and tools and equipment as far back from the edge of the floors as possible.

C. Materials shall be adequately covered, protected, and secured to avoid being blown around.

1.07 TRAFFIC REGULATIONS

A. The Contractor shall be responsible for conforming to local regulations governing load limits of vehicles.

B. The Contractor shall be responsible for regulating his traffic around the site in accordance with local regulations including parking and flagmen.

1.08 MATERIAL AND EQUIPMENT

A. Provide openings in slabs, walls and partitions where required for moving in large pieces of material and equipment of all types. Close and/or restore all openings and finish them after the equipment is in place. Structural modification, if required, shall be subject to prior approval by the Architect/Engineer.

B. Protect all finished surfaces, including jambs and soffits of all openings used as passageways or through which materials are handled, against any possible damage resulting from the conduct of work by all trades. Tops of unfinished walls exposed to the weather shall be covered with suitable coverings, secured as necessary.

C. All finished surfaces, including factory-finished and job-finished items shall be clean and not marred upon delivery of the building to the Owner. The Contractor shall, without extra compensation refinish such spaces where such surfaces prove to have been inadequately protected and are damaged.

D. Tight wood sheathing shall be laid under any materials that are stored on finished cement surfaces. Reinforced building paper and plywood or planking must be laid over all types of finished floor surfaces in traffic areas before moving any materials over these finished areas. Wheelbarrows, if used over such areas shall have rubber tired wheels.

E. Roof surfaces shall not be subjected to traffic nor shall they be used for storage of material. Where some activity must take place in order to carry out the Contract, adequate protection shall be provided.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section specifies the requirements for the management of non-hazardous building construction and demolition waste.

B. Waste disposal in landfills shall be minimized to the greatest extent possible. Of the inevitable waste that is generated, as much of the waste material as economically feasible shall be salvaged, recycled or reused.

C. Contractor shall use all reasonable means to divert construction and demolition waste from landfills and incinerators, and facilitate their salvage and recycle not limited to the following:

1. Waste Management Plan development and implementation.
2. Techniques to minimize waste generation.
3. Sorting and separating of waste materials.
4. Salvage of existing materials and items for reuse or resale.
5. Recycling of materials that cannot be reused or sold.

D. At a minimum the following waste categories shall be diverted from landfills:

1. Soil.
2. Inerts (e.g., concrete, masonry and asphalt).
3. Clean dimensional wood and palette wood.
4. Green waste (biodegradable landscaping materials).
5. Engineered wood products (plywood, particle board and I-joists, etc.).
6. Metal products (e.g., steel, wire, beverage containers, copper, etc.).
7. Cardboard, paper and packaging.
8. Bitumen roofing materials.
9. Plastics (e.g., ABS, PVC).
10. Carpet and/or pad.
11. Gypsum board.
12. Insulation.
13. Paint.
14. Fluorescent lamps.

1.02 RELATED WORK

A. Section 02 41 00, Selective Demolition.

B. Section 01 00 00, JBVAMC Supplemental General Requirements.

1.03 QUALITY ASSURANCE

A. Contractor shall practice efficient waste management when sizing, cutting and installing building products. Processes shall be employed to ensure the generation of as little waste as possible. Construction /Demolition waste includes products of the following:

1. Excess or unusable construction materials.
2. Packaging used for construction products.
3. Poor planning and/or layout.
4. Construction error.
5. Over ordering.
6. Weather damage.
7. Contamination.
8. Mishandling.
9. Breakage.

B. Establish and maintain the management of non-hazardous building construction and demolition waste set forth herein. Conduct a site assessment to estimate the types of materials that will be generated by demolition and construction.

C. Contractor shall develop and implement procedures to reuse and recycle new materials to a minimum of 50 percent.

D. Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling. Any revenues or savings obtained from salvage or recycling shall accrue to the contractor.

E. Contractor shall provide all demolition, removal and legal disposal of materials. Contractor shall ensure that facilities used for recycling, reuse and disposal shall be permitted for the intended use to the extent required by local, state, federal regulations. The Whole Building Design Guide website http://www.wbdg.org provides a Construction Waste Management Database that contains information on companies that haul, collect, and process recyclable debris from construction projects.

F. Contractor shall assign a specific area to facilitate separation of materials for reuse, salvage, recycling, and return. Such areas are to be kept neat and clean and clearly marked in order to avoid contamination or mixing of materials.

G. Contractor shall provide on-site instructions and supervision of separation, handling, salvaging, recycling, reuse and return methods to be used by all parties during waste generating stages.

H. Record on daily reports any problems in complying with laws, regulations and ordinances with corrective action taken.

1.04 TERMINOLOGY

A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial and industrial waste resulting from construction, remodeling, repair and demolition operations.

B. Clean: Untreated and unpainted; uncontaminated with adhesives, oils, solvents, mastics and like products.

C. Construction and Demolition Waste: Includes all non-hazardous resources resulting from construction, remodeling, alterations, repair and demolition operations.

D. Dismantle: The process of parting out a building in such a way as to preserve the usefulness of its materials and components.

E. Disposal: Acceptance of solid wastes at a legally operating facility for the purpose of land filling (includes Class III landfills and inert fills).

F. Inert Backfill Site: A location, other than inert fill or other disposal facility, to which inert materials are taken for the purpose of filling an excavation, shoring or other soil engineering operation.

G. Inert Fill: A facility that can legally accept inert waste, such as asphalt and concrete exclusively for the purpose of disposal.

H. Inert Solids/Inert Waste: Non-liquid solid resources including, but not limited to, soil and concrete that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional water board, and does not contain significant quantities of decomposable solid resources.

I. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.

J. Mixed Debris Recycling Facility: A solid resource processing facility that accepts loads of mixed construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing non-recyclable materials.

K. Permitted Waste Hauler: A company that holds a valid permit to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.

L. Recycling: The process of sorting, cleansing, treating, and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.

1. On-site Recycling – Materials that are sorted and processed on site for use in an altered state in the work, i.e. concrete crushed for use as a sub-base in paving.
2. Off-site Recycling – Materials hauled to a location and used in an altered form in the manufacture of new products.

M. Recycling Facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of new products. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a solid waste facilities permit or be regulated by the local enforcement agency.

N. Reuse: Materials that are recovered for use in the same form, on-site or off-site.

O. Return: To give back reusable items or unused products to vendors for credit.

P. Salvage: To remove waste materials from the site for resale or re-use by a third party.

Q. Source-Separated Materials: Materials that are sorted by type at the site for the purpose of reuse and recycling.

R. Solid Waste: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.

S. Transfer Station: A facility that can legally accept solid waste for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal, or recovering some materials for re-use or recycling.

1.05 SUBMITTALS

A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES, furnish the following:

B. Prepare and submit to the Resident Engineer a written demolition debris management plan. The plan shall include, but not be limited to, the following information:

1. Procedures to be used for debris management.

2. Techniques to be used to minimize waste generation.

3. Analysis of the estimated job site waste to be generated:

a. List of each material and quantity to be salvaged, reused, and recycled.

b. List of each material and quantity proposed to be taken to a landfill.

4. Detailed description of the Means/Methods to be used for material handling.

a. On site: Material separation, storage, protection where applicable.

b. Off site: Transportation means and destination. Include list of materials.

1) Description of materials to be site-separated and self-hauled to designated facilities.

2) Description of mixed materials to be collected by designated waste haulers and removed from the site.

c. The names and locations of mixed debris reuse and recycling facilities or sites.

d. The names and locations of trash disposal landfill facilities or sites.

e. Documentation that the facilities or sites are approved to receive the materials.

C. Designated Manager responsible for instructing personnel, supervising, documenting and administer over meetings relevant to the Waste Management Plan.

D. Monthly summary of construction and demolition debris diversion and disposal, quantifying all materials generated at the work site and disposed of or diverted from disposal through recycling.

1.06 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced by the basic designation only. In the event that criteria requirements conflict, the most stringent requirements shall be met.

B. U.S. Green Building Council (USGBC):

C. LEED Green Building Rating System for New Construction

1.07 RECORDS

A. Maintain records to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. Records shall be kept in accordance with the LEED Reference Guide and LEED Template.

PART 2 - PRODUCTS

2.01 MATERIALS

A. List of each material and quantity to be salvaged, recycled, and reused.

B. List of each material and quantity proposed to be taken to a landfill.

C. Material tracking data: Receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices, net total costs or savings.

PART 3 - EXECUTION

3.01 COLLECTION

A. Provide all necessary containers, bins and storage areas to facilitate effective waste management.

B. Clearly identify containers, bins and storage areas so that recyclable materials are separated from trash and can be transported to respective recycling facility for processing.

C. Hazardous wastes shall be separated, stored, disposed of according to local, state, federal regulations.

3.02 DISPOSAL

A. Contractor shall be responsible for transporting and disposing of materials that cannot be delivered to a source-separated or mixed materials recycling facility to a transfer station or disposal facility that can accept the materials in accordance with state and federal regulations.

B. Construction or demolition materials with no practical reuse or that cannot be salvaged or recycled shall be disposed of at a landfill or incinerator.

3.03 REPORT

A. With each application for progress payment, submit a summary of construction and demolition debris diversion and disposal including beginning and ending dates of period covered.

B. Quantify all materials diverted from landfill disposal through salvage or recycling during the period with the receiving parties, dates removed, transportation costs, weight tickets, manifests, invoices. Include the net total costs or savings for each salvaged or recycled material.

C. Quantify all materials disposed of during the period with the receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, and invoices. Include the net total costs for each disposal.

END OF SECTION

SECTION 01 91 00

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SUMMARY

A. Work includes declarations, inspections, and submittals necessary to obtain final acceptance of the Work on this project.

B. Related requirements specified elsewhere:

1. Section 01 53 23 - Submittals (Shop Drawings, Product Data and Samples)
2. Section 01 91 10 - Cleaning
3. Section 01 91 20 - Project Record Documents

1.02 SUBSTANTIAL COMPLETION

A. Contractor:

1. Submit written declaration to VA that project, or designated portion of project, is substantially complete.
2. Submit list of items to be completed or corrected.

B. Owner and VA will make preliminary inspection within seven days after receipt of Contractor's declaration.

C. Should Owner and VA-Architect/Engineer consider that work is substantially complete:

1. VA will prepare a punch list of items to be completed or corrected, as determined by the inspection.
2. Contractor: Complete Work listed for completion or correction, within designated time.

D. At time of inspection, should substantial completion not be certified, complete the Work and resubmit declaration in accordance with 1.02A.

1.03 FINAL INSPECTION

A. Contractor shall submit written declaration to Owner and VA that:

1. All aspects of Contract Documents have been complied with.
2. All items on substantial completion punch list have been completed.
3. All tools, construction equipment and surplus materials have been removed from site.

B. Contractor with Owner and VA-Architect/Engineer will make final inspection to ensure completion of all contract requirements.

C. When Owner and Architect/Engineer consider that work is finally complete in accordance with Contract Document requirements, the Contractor will prepare and process closeout documents.

1.04 CLOSEOUT SUBMITTALS

A. Project record documents: Conform with Section 01 91 20.

B. Deliver evidence of compliance with requirements of governing authorities:

1. Certificates of inspection
2. Certificates of occupancy

C. Paid utility bills.

1.05 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit the final application for payment in accordance with Contract Documents.

END OF SECTION

SECTION 01 91 10

CLEANING

PART 1 - GENERAL

1.01 SUMMARY

A. During the course of the Work, maintain premises and adjacent properties free of waste, debris and rubbish caused by construction operations.

B. At completion of Work, or at such other times as directed by the VA, remove all waste, debris, rubbish, tools, equipment, machinery and surplus materials. Clean all sight-exposed surfaces; leave Work clean and ready for occupancy.

1.02 SAFETY REQUIREMENTS

A. Standards: Maintain Project in accord with following safety and insurance standards:
   1. Occupation Safety and Health Administration (OSHA)

B. Hazards Control:
   1. Store volatile wastes in an approved manner or remove from premises daily.
   2. Prevent accumulation of wastes that create hazardous conditions.
   3. Provide adequate ventilation during use of volatile or noxious substances.

C. Conduct cleaning and disposal operations to comply with federal, state and local antipollution laws.
   1. Rubbish and waste materials shall not be burned or buried on Project site.
   2. Volatile wastes such as mineral spirits, oil or paint thinner shall not be disposed of into storm or sanitary drains.
   3. Wastes shall not be disposed of into streams or waterways.

1.03 SUBMITTALS

A. Manufacturer's recommendations for cleaning specified products.

B. Proposed cleaning products for products where manufacturer's recommendations are not specified.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Select and use all cleaning materials and equipment with care to avoid scratching, marring, defacing, staining or discoloring surfaces cleaned.

B. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 GENERAL

A. Execute cleaning to ensure that building, grounds and public properties are maintained free from accumulations of waste materials and rubbish.
B. Wet down materials and rubbish to lay dust and to prevent blowing dust.
C. At least twice weekly, during progress of Work, clean site and public properties and dispose of waste materials, debris and rubbish.
D. Provide on-site transportable cart containers for collection of waste, materials, debris and rubbish as required.
E. Removed waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off Owner's property.
F. Handle materials in a controlled manner with as few handlings as possible. Materials shall not be thrown from heights.
G. Remove snow and ice from access to building.
H. Clean interior building areas when ready to receive floor, wall and ceiling finishes. Continue cleaning on an as-needed basis until building is ready for Substantial Completion or Occupancy.
I. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

3.02 FINAL CLEANING

A. Employ experienced workmen, or professional cleaners, for final cleaning.
B. In preparation for Substantial Completion, or occupancy, conduct final inspection of sight-exposed interior or exterior surfaces, and of concealed spaces.
C. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from sight-exposed interior and exterior finished surfaces; polish surfaces so designated to shine finish.
D. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.
E. Broom clean paved surfaces; rake clean other surfaces on grounds.
F. Replace air handling (conditioning) filters if units were operated during construction.
G. Clean ducts, blowers and coils, if air handling (conditioning) units were operated without filters during construction.
H. Maintain cleaning until Project, or designated portion thereof, is occupied by Owner.

END OF SECTION

SECTION 01 91 20

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. The Contractor shall maintain Record Documents and present them to the Owner at the completion of the Work, as described below. All project Record Documents submitted by Contractor shall be in Word or Excel format.

1.02 MAINTENANCE OF DOCUMENTS

A. Maintain at jobsite, one copy of:

1. Contract drawings
2. Project Manual
3. Interpretations and supplemental instructions
4. Addenda
5. Reviewed shop drawings
6. Change orders
7. Other modifications to Contract
8. Field test records
9. All schedules
10. Correspondence file
11. Provide drawings showing the installed locations of Helifixes

B. Store Documents in temporary field office apart from documents used for construction.
C. Provide files and racks for Document storage.
D. File Documents in accordance with Specification Sections.
E. Maintain Documents in clean, dry, legible conditions.
F. Record Documents shall not be used for construction purposes.
G. Make Documents available at all times for inspection by Architect/Engineer and Owner.

1.03 MARKING DEVICES

A. Provide red pens for marking prints.

1.04 RECORDING

A. Label each Document "PROJECT RECORD" in 2-in. high printed letters.
B. Keep Record Documents current.
C. No part of the Work shall be permanently concealed until required information has been recorded.
D. Contract Drawings: Legibly mark to record actual construction:

1. Field changes of dimensions and detail.
2. Changes made by Change Order or Field Order.
3. Details not on original Contract Drawings.

E. Specifications and Addenda: Legibly mark up each Section to record:
1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
2. Changes made by Change Order or Field Order.
3. Other matters not originally specified.

F. Shop Drawings: Maintain as Record Documents; legibly annotate to record changes made after review.

1.05 SUBMITTAL

A. At completion of Project, deliver Record Documents to the Architect/Engineer.

B. Accompany submittal with transmittal letter, in duplicate, containing:
1. Date
2. Project title and number
3. Contractor's name and address
4. Title and number of each Record Document
5. Certification that each Document as submitted is complete and accurate
6. Signature of Contractor, or his authorized representative.

END OF SECTION

DIVISION 2 - EXISTING CONDITIONS

SECTION 02 23 00

EXISTING CONDITIONS

PART 1 - GENERAL

1.01 EXISTING DIMENSIONS AND ATTACHMENTS

A. The Contractor shall be responsible for obtaining and verifying all dimensions. **Any dimensions given in the drawings referring to existing construction were taken from the original construction documents and are provided for information only.**

B. The Contractor shall be responsible for verifying all existing attachments to remain and be reused. **Any information given in the drawings referring to existing construction was taken from the original construction documents and is provided for information only.**

C. Where conditions are uncovered that are not anticipated by the drawings and specifications, the Contractor shall notify the Contracting Officer's Technical Representative (COR) immediately. The COR will contact Wiss, Janney, Elstner Associates, Inc. (WJE) immediately, before any repairs are initiated, so WJE can determine the effect of conditions on the overall repair standard.

D. The drawings and specifications were developed by Frega & Associates Ltd. And WJE specifically for this project.

END OF SECTION

SECTION 02 41 00

DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. Work includes:
   1. Execute cutting, filling or patching of Work, required to:
      a. Make several parts fit properly.
      b. Uncover work to provide for installation of ill-timed work.
      c. Remove and replace defective work.
      d. Remove and replace work not conforming to contract requirements.
      e. Remove samples of installed work as specified for testing.
      f. Install specified work in existing construction.
   2. In addition to Contract requirements, upon written instructions of Architect/Engineer.
      a. Uncover work to provide for observation of covered work.
      b. Remove work to provide for alteration of existing work.
   3. Do not endanger work by cutting or altering work or any part of it.
   4. Do not cut or alter work of another Contractor without written consent of Architect/Engineer.

1.02 SUBMITTALS

A. Prior to cutting which affects structural safety of Project, or work of another Contractor, submit written notice to Architect/Engineer requesting consent to proceed with cutting, including:
   1. Project identification
   2. Description of affected work
   3. Necessity for cutting
   4. Effect on other work, on structural integrity of Project
   5. Description of proposed work. Designate:
      a. Scope of cutting and patching
      b. Contractor and trades to execute the work
      c. Products proposed to be used
      d. Extent of refinishing.

B. Prior to cutting and patching done on instruction of Architect/Engineer submit cost estimate.

C. Should conditions of work, or schedule, indicate change of materials or methods, submit recommendation to Architect/Engineer including:
   1. Condition indicating change
   2. Recommendation for alternative materials or methods

PART 2 - PRODUCTS

2.01 MATERIALS

A. For replacement of work removed, comply with specifications for type of work to be performed.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect existing conditions of work, including elements subject to movement or damage during cutting and patching.

B. After uncovering work, inspect conditions affecting installation of new products.

3.02 PREPARATION

A. Prior to cutting:
   1. Provide shoring, bracing and support as required to maintain structural integrity of project.
   2. Provide protection for other portions of the Project.
   3. Provide protection from elements.

3.03 PERFORMANCE

A. Cutting and patching shall be performed only by skilled workmen who normally perform the kind of Work being performed.

B. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances, finishes.

C. Execute cutting by methods, which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs and new work.

D. Restore work, which has been cut or removed; install new products to provide completed work in accord with Contract requirements.

E. Refinish entire surfaces as necessary to provide an even finish.
   1. Continuous surfaces: To nearest intersection(s)
   2. Assembly: Entire refinishing

END OF SECTION

SECTION 02 41 10

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials, tools and equipment and perform all Work necessary for and incidental to the selective demolition as shown on the Drawings and specified herein and completely coordinated with the Work of all other trades.

1.02 SUBMITTALS

A. Submit the following in accordance with Section 01 53 23:

1. Permits for transport and disposal of debris.
2. Demolition Schedule (proposed sequence of demolition and removal operations).
3. Proposed means of fire safety precautions and practices during welding and cutting operations.

1.03 QUALITY ASSURANCE

A. Conform to codes and requirements of governing authority.

B. Obtain and pay for all permits for demolition; protection of the public and property; transportation and disposal of debris.

1.04 SITE CONDITIONS

A. Condition of Structures: The Owner assumes no responsibility for the actual condition of portions to be demolished or adjacent portions undergoing restoration.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 SALVAGE

A. Items of salvageable value to the Contractor may be removed from the structure as the Work progresses.

B. Salvaged items must be transported from the site as they are removed. Storage or sale of removed items on the site will not be permitted.

3.02 EXPLOSIVES

A. Do not bring explosives to the site or use any explosives.

3.03 TRAFFIC

A. Conduct demolition operations and the removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

3.04 PROTECTION

A. Design and provide temporary canopies, walls, and signage to ensure the safe passage of persons around the area of demolition. Conduct operations to prevent injury to persons, the structure, and other facilities.

B. Provide interior and exterior shoring, bracing, or support to prevent movement or settlement or collapse of structures during demolition and of structures and facilities to remain. Contractor to design shoring.

C. Provide temporary protection of existing construction from the weather until removed portions are completely replaced with new construction.

D. Maintain existing utilities, keep in service, and protect against damage during demolition operations. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by Owner. Provide temporary services during interruptions to existing utilities.

3.05 POLLUTION CONTROL

A. Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to a level acceptable to the Owner. (Also refer to Section 01 57 19) Comply with governing regulations pertaining to environmental protection. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations.

B. Provide adequate ventilation as required to eliminate noxious fumes or odors.

3.06 DEMOLITION

A. Demolish indicated items completely and remove from the site. Use such methods as required to complete the Work within the limitations of governing regulations.

B. Demolish materials in small sections to facilitate removal.

C. Remove overhead materials and lower to the ground by means of hoists, derricks, or other suitable methods.

D. Locate demolition equipment throughout the structure and remove materials so as not impose excessive loads to supporting walls, floors or framing.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove from the site debris, rubbish, and other materials resulting from demolition operations. Burning of removed materials is not permitted on the site.

B. Transport materials removed from demolished portions in accordance with codes and requirements of governing authority.

C. Dispose of materials removed from demolished portions off site at a location where specific permission for disposal has been obtained.

3.08 REPAIRS

A. Repair any areas of demolition in excess of that required and any damage to adjoining construction. Repairs must, as a minimum standard, restore the condition, which existed prior to the start of demolition.

END OF SECTION

SECTION 02 80 50

SITE RESTORATION

PART 1 - GENERAL

1.01 SUMMARY

A. Repair and/or replace areas of the site damaged during demolition and construction operations including, but not limited to, utilities, landscaping, sidewalks, curbs, pavements and site furnishings immediately after completion of all operations in that area. Repairs must, as a minimum standard, be equal to or exceed the condition, which existed prior to the start of Work under this contract.

1.02 SUBMITTALS

A. The Contractor shall submit to the Owner and Owner's Representative for approval three (3) copies of a statement detailing the restoration Work required.

B. The statement shall as a minimum contain the following:
   1. Description of Work
   2. Location and quantity of Work
   3. Materials and standard for workmanship
   4. Schedule of operations

C. Approval of this statement by the Owner and/or Owner's Representative shall not constitute approval of methods or materials. Such approval shall not be granted until the Work is installed and fully cured.

1.03 QUALITY ASSURANCE

A. Qualifications
   1. Contractor shall employ Subcontractors and/or tradesmen with a minimum two (2) years of experience in performing the Work required.

1.04 WARRANTY

A. The Contractor shall guarantee the Work against defects in materials and workmanship in accordance with the General Conditions, except that the guarantee period for landscaping shall be a minimum of one (1) planting season beyond the date of installation.

   1. This guarantee shall include furnishing new plants as well as labor and materials for installation of replacements. All replacement plants shall be guaranteed and maintained for the period of one (1) season. Guarantee is limited to one replacement per plant.
   2. Contractor will not be held responsible for damages to or loss of plants caused by fire, flood, lightning storms, freezing rain, winds over 60 miles per hour, or vandalism.
   3. Inspection of the planting will be made jointly by the Contractor and Owner's Representative at the Completion of planting. All plants not in a healthy, growing condition shall be removed and replaced with plants of like kind, size and quality as originally specified before the close of the next planting season.
   4. At the end of the guarantee period, the Contractor shall remove all guying, staking, wrapping, saucers and mulch from the site.

PART 2 - PRODUCTS

2.01 UTILITIES

A. All restoration of utility service shall be in full compliance with the requirements of the utility service provider.

2.02 LANDSCAPING

A. Lawns shall be restored by placement of sod (or seed if acceptable to Owner) to match the existing type of grass.

B. Plant materials shall be replaced with the same species and size as plant being replaced.

2.03 PAVING AND SURFACING

A. Replacement of all damaged paving, walks, curbs, and other surfacing on the site shall match the adjacent material to remain in color, shape and texture.

2.04 SITE FURNISHINGS

A. All site furnishings damaged during construction operations shall be replaced in kind.

PART 3 - EXECUTION

3.01 LANDSCAPING

A. Prior to placement of new lawn material, the area shall be graded to match adjacent areas with a minimum of 6 in. of top soil scarified to a depth of 2-3 in.

B. All areas to receive seed and/or sod shall be prepared, fertilized, protected and maintained as necessary until the following condition is achieved.

1. Seeded Areas: Lawn has been mowed three times when it reaches a height of 3 in. Bare spots shall not exceed 3 percent.
2. Sodded Areas: Sod is firmly knit and been mowed, two times when it reaches a height of 3 in. Areas of nonuniform growth exceeding one square foot shall be replaced.

C. Plantings shall be set in appropriate pits, backfilled, mulched, guyed, staked or otherwise protected.

3.02 PAVING AND SURFACING

A. Means and methods for the installation of replacement pavings, walks, curbs and other surfacing shall be in accordance with local construction standards.

END OF SECTION

DIVISION 3 - CONCRETE

SECTION 03 10 00

WOOD FORMS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide forms for cast-in-place repairs of large areas of concrete.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Design and construction of formwork shall be the responsibility of the Contractor and shall be performed in accordance with ACI 347, and as supplemented and modified herein.

B. Forms shall conform to shape, lines, grade, and dimensions of existing members and shall be braced and tied together to maintain position and shape during placement of concrete. Supports shall be spaced sufficiently close to prevent deflection of form material.

C. Forms shall be readily removable without hammering, prying or damage to concrete. Metal tools shall not come in contact with concrete surfaces during form removal. All exposed concrete corners shall be finished to match existing corners.

D. Forms for surfaces exposed to view shall be constructed of new 5/8 in. or 3/4 in. 5-ply structural plywood of concrete-form grade. Plywood may be reused for formed surfaces exposed to view as long as it is in good condition.

E. Wood forms used with latex-modified concrete shall first be coated with two coats of shellac or polyurethane varnish on the surface(s) to receive concrete. No form release agents shall be used on the forms.

F. All devices used to anchor formwork to the existing concrete members shall be stainless steel, drilled-in anchors, subject to the approval of the Architect/Engineer prior to use. Samples should be submitted to the Architect/Engineer for each type of anchor proposed for use.

PART 3 - EXECUTION

3.01 FORMWORK INSTALLATION

A. Formwork must be securely fastened to the face of the building. The method of attachment is subject to the review and approval of the Architect/Engineer prior to the start of construction.

The Contractor shall submit sketches of the method of installation of all typical formwork setups to the Architect/Engineer for approval, prior to the start of construction. All portions of the anchors that will remain in place should be recessed 1/2 inch back from the exposed concrete surface, and the recessed hole should be filled with sealant after removal of the loose components of the anchorage device.

B. The Contractor shall be responsible for seeing that no pieces of formwork become dislodged from the side of the building. The Contractor shall bear full responsibility for any injuries and/or property damage that may result should any pieces of formwork fall from the building.

END OF SECTION

SECTION 03 21 20

EPOXY-COATED REINFORCING STEEL

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide epoxy-coated reinforcing steel bars to replace damaged bars or to replace bar cross section loss due to corrosion.

1.02 SUBMITTALS

A. Submit samples of all plastic tie wire devices proposed for use in this project.

B. Information on use and application of epoxy resin.

C. Certification of proper resin formulation by manufacturer.

D. Certification from coating applicator of flexibility and bending requirements of coating on bent bars.

E. Samples of each size of coated bar.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcing steel: All reinforcing steel shall be Grade 60 (60,000 psi yield strength) as defined in ASTM A615. All reinforcing to be used shall be epoxy-coated. The coating shall consist of a protective coating of epoxy applied by electrostatic spray method or electrostatic fluidized-bed method in accordance with the resin manufacturer's recommendations and these specifications.

B. The coated bars shall be free of slivers and defects. The coated bars shall meet the physical properties herein specified and may be inspected for approval at the coating plant. A certification statement stating that all bars have been coated in accordance with the resin manufacturer's recommendations, these specifications, and the "Standard Specification for Epoxy-Coated Reinforcing Bars" (ASTM A775) shall be furnished with each shipment. This certification shall include for each bar size, the preheat temperatures, cure times, thickness checks, holidays detected, and bend test results. Two copies of this certification shall be submitted to the Architect/Engineer prior to the installation of any of the reinforcing steel bars.

2.02 ACCESSORY MATERIALS

A. Tie Wire: All tie wire shall be 16 gage or heavier, stainless steel wire. Alternately, plastic tie wire may be used subject to the approval of the Architect/Engineer. Samples of all plastic ties must be submitted to the Architect/Engineer for approval in advance of the start of the work.

2.03 EPOXY COATING

A. All reinforcing steel bars [and welded wire mesh] shall be epoxy-coated. The coating material shall be a powdered epoxy resin meeting the requirements of ASTM A775. The manufacturer of the resin shall provide written certification that the material furnished for the coating of the reinforcing steel meets the requirements contained in ASTM A775.

B. The coating shall consist of a fusion-bonded protective coating of epoxy powder applied by electrostatic spray method or electrostatic fluidized-bed method in accordance with the resin manufacturer's recommendations and these Specifications. Coating shall be applied in a uniform, smooth film with a thickness after curing of at least 7 mils, measured in accordance with ASTM A775.

C. The coated reinforcing shall be free of slivers and from visible holes, voids, contamination, cracks, and other defects, with less than 1 percent of the coating damaged in a given length of bar. The continuity and flexibility of the coating shall be checked in accordance with ASTM A775 and shall meet the requirements described therein.

D. The coated reinforcing shall meet the physical properties specified in Article 2.1 - Materials above, and may be inspected for approval at the coating plant. All epoxy-coated reinforcing shall be supplied by an epoxy-coating application plant certified by the CRSI Voluntary Certification Program for Fusion Bonded Epoxy Coating Application Plants. A statement certifying this shall be furnished with each shipment.

E. Patching or Repair Materials: Liquid, two-part, epoxy repair coating; compatible with the epoxy coating on reinforcement and inert in concrete, shall be supplied by the epoxy resin manufacturer. The material shall be suitable for repairing areas of damaged coating and shall comply with the requirements of ASTM A775.

2.04 FABRICATION

A. Fabricate and detail steel reinforcement to shapes and dimensions shown on Drawings in accordance with ACI315 and the CRSI "Manual of Standard Practice" within the fabricating tolerances shown in the CRSI "Manual of Standard Practice".

B. All bends and hooks shall conform to the bend dimensions defined as "ACI Standard Hooks" in the CRSI "Manual of Standard Practice" unless otherwise shown on the plans.

C. Reinforcing bars shall not be bent or straightened in a manner that will injure the coating material. For some bar sizes, the rate of bending may need to be reduced to minimize cracking or debonding of the coating. Visible cracking or debonding of the coating in the bending area of bars bent in accordance with the Drawings shall be patched, except that a hairline crack (0.003 in. or less in width) at the base of the deformation will not be cause for rejection, nor will patching of these cracks be required. All patching shall be done promptly after bending.

PART 3 - EXECUTION

3.01 PLACING REINFORCING STEEL

A. The placement of bars should conform to the CRSI Manual of Standard Practice.

B. Bars should be securely tied to prevent displacement during the pouring operation and all dowels must be wired in place before depositing concrete.

C. Contractor shall obtain the Architect's/Engineer's approval as to condition and placement of reinforcing prior to completing formwork and the ordering/placing of concrete.

D. All splicing of bars, concrete cover, and bar spacings shall conform to the Drawings or to ACI 315 and CRSI Manual of Standard Practice if not shown on the Drawings.

E. Tie wires shall be bent and turned with their ends directed towards the inside of the concrete section, not toward exposed concrete surfaces.

F. All reinforcing shall be no closer than ¾ in., measured radially from existing concrete. The elevation of all reinforcing shall be maintained at the original height.

G. Runways or another approved protection scheme shall be provided for reinforcing located in a pour or which extends into the pour, in order to prevent damage from moving equipment or pumping equipment.

H. Unless permitted by the Architect/Engineer, reinforcing shall not be bent after being embedded in hardened concrete.

3.02 PATCHING

A. Patching material shall be applied to all sheared ends and contact areas for hangers or couplers. Patching materials shall be applied to all damaged areas at the point of occurrence, such as at the initial application, fabrication, destination, or installation points

B. Areas to be patched shall be clean and free of surface contaminants. They shall be promptly treated in accordance with the resin manufacturer's recommendations and before detrimental oxidation occurs. Such rust that does occur shall be removed suitable means prior to application of the epoxy repair coating. Patching of cut and damaged epoxy coatings shall be in accordance with ASTM D3963

END OF SECTION

SECTION 03 31 00

CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

A. This work shall consist of providing the necessary labor, materials, equipment and supervision to form, place, finish and cure concrete which is cast at properly prepared existing concrete surfaces or formed surfaces in parking garage floor slabs.

1.02 SUBMITTALS

A. Submit concrete mix designs a minimum of two weeks before their intended uses, in accordance with Section 01 53 23 and as described later in this section.

B. Submit reports of concrete tests at the end of each day's testing, as described later in this section. Also submit concrete delivery tickets at the end of each day.

C. Submit required warranty.

D. Submit NRMCA ready mixed concrete facility certification.

E. Submit MSDS information as applicable.

1.03 WARRANTY

A. All concrete repairs shall be guaranteed for a period of three (3) years against all surface defects, delamination of the patch material from the substrate concrete, delamination within the patch material itself, and patch deterioration.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

C. Manufacturer certified according to NRMCA’s “Certification of Ready Mixed Concrete Production Facilities.”

PART 2 - PRODUCTS

2.01 CONCRETE MIX REQUIREMENTS

A. Repair concrete shall be a normal weight concrete with a 28-day design compressive strength of 5,000 psi.

B. The entrained air content shall be 6% ± 1½% for repair concrete, and shall be measured according to ASTM C231.

C. The cement content shall be at least 5½ bags per cubic yard. Water-cement ratio shall be such as to produce a slump of 2½ ± 1½ in. without exceeding the specified water-cement ratio of 0.45. The specified slump shall apply at the time when the concrete arrives at the job site.

D. Class F Fly Ash may be substituted for up to 25% of the cement content.

E. A high range water-reducing admixture (superplasticizer) may be added to obtain a higher slump as necessary for proper concrete placement and consolidation without exceeding the specified water-cement ratio. The superplasticizer shall be compatible with all other mix ingredients and shall be included in the mix design testing. The superplasticizer shall be added at the site after slump measurements are made. The slump shall be such that the finished surface remains straight, without sagging or bulging due to gravity on the plastic mix.

F. Whenever the temperature is above 80°F, the Contractor shall provide an approved admixture to be added to the concrete for retarding the initial set of the concrete. The admixture shall be used in strict accordance with the manufacturer's recommendations.

G. Mix designs for normal weight concrete used for concrete repairs shall be proportioned in accordance with ACI 211.1 and this specification. Mix designs proposed for use, when tested in a laboratory, shall have an average 28-day compressive strength in excess of design strength as required in Chapter 4 of ACI 318.

2.02 MATERIALS

A. Portland Cement shall conform to ASTM C150, Type I, of the same type, brand, and source throughout Project.

B. Admixtures: The following types of admixtures may be used when approved by the Architect/Engineer.

1. Air-entraining Admixtures ASTM C260

2. Chemical Admixtures ASTM C494

C. Calcium chloride shall not be permitted in the concrete as an intentional additive.

D. Fine and coarse aggregates for normal weight concrete shall conform to ASTM C33, Class 3S or 3M or 1N. Aggregates for Project must be supplied from a single source.

1. Minimum percentages of coarse aggregate by weight of total aggregate shall be 55 percent.

2. Coarse aggregate gradation shall conform to gradation size number 67.

E. Mixing water shall be potable, clean and free of injurious quantities of substances known to be harmful to Portland cement.

F. Fly Ash ASTM C618, Class F, provided aggregates meet ASTM C33.

2.03 TESTING OF CONCRETE MIX DESIGNS

A. Mix designs of each separate mix shall be prepared and the following data shall be submitted to the Architect/Engineer for each mix design. The Contractor shall bear all costs relating to these tests:

1. Sieve analysis for fine and coarse aggregate
2. Test for aggregate organic impurities
3. Proportions of all materials
4. Mill certificates for cement
5. Slump, during laboratory tests
6. Air content, during laboratory tests
7. 7- and 28-day laboratory compression test results (minimum 3 cylinders for the 7-day and 3 cylinders for the 28-day tests plus one extra)

B. A mix design previously used and which complies with the specifications may be submitted for approval. All information noted above shall be included. During the construction, tests will be made by an approved testing agency to determine if the concrete complies with the quality specified. The Contractor shall cooperate in the making of such tests to the extent of allowing free access to the work for the selection of samples and the storage of specimens, and in affording protection to specimens against injury or loss through his operations. The Contractor shall furnish all concrete or testing and shall be responsible for contacting the testing agency at the appropriate time so that a representative is present at the site during concrete placement. Concrete

placement is subject to cancellation if the material is not tested prior to placement in accordance with these specifications.

PART 3 - EXECUTION

3.01 BATCHING AND MIXING

A. All concrete shall be delivered to the site ready-mixed. Ready-mix concrete shall be batched, mixed and transported in accordance with applicable provisions of ASTM C94/C94M. Furnish batch ticket information as requested by Architect/Engineer.

1. Batch plants used in production of ready-mixed concrete shall comply with standards set forth by the Concrete Plant Manufacturers Bureau of the National Ready-Mixed Concrete Association.
2. Truck mixers, agitators, and non-agitating units used to mix and transport ready-mix concrete shall comply with Standards of Truck Mixer Manufacturers Bureau of the National Ready-Mixed Concrete Association.
3. Ready-mixed concrete production facilities shall be currently certified by the National Ready-Mixed Concrete Association and the Contractor shall submit a copy of that certification to the Architect/Engineer.
4. Concrete shall be delivered to the site and discharged within 1 hour or before 300 revolutions of mixer drum after introduction of mixing water. Due to the nature of this work, trucks with short loads may be required. Concrete that exceeds the above specified time limitation will be rejected.
5. Indiscriminate addition of water to increase the slump is prohibited. When concrete arrives at project site with a slump below that suitable for placing, water may be added providing the maximum permissible slump is not exceeded. In the event water is added at site, it shall be incorporated by additional mixing equal to at least 30 revolutions of the drum at mixing speed recommended by manufacturer. If additional water is added, the amount added shall be noted on delivery ticket and ticket signed by person authorizing addition of water. Concrete to which water has been added in such amounts as to cause the water/cement ratio to exceed the specified maximum allowable value will be rejected.
6. When a high range water-reducing admixture is added, it shall be incorporated at the site by additional mixing as specified by the manufacturer. If unspecified, 70 revolutions of the drum shall be required to ensure proper mixing.
7. When concrete arrives at job site with a slump exceeding the maximum specified slump, concrete shall be rejected.

B. Air-entraining and chemical admixtures, when used, shall be incorporated into the mix in amounts and manner recommended by the manufacturer and approved by the Architect/Engineer. Accuracy of measurement of any admixture shall be within ±3 percent. Two or more admixtures may be used in the same concrete provided such admixtures are added separately and that the combination is compatible and has no deleterious effect on the concrete.

C. The temperature of the concrete, when discharged, shall be not less than 65°F when the air temperature is below 40°F. If heated water or aggregates are used, the water shall be combined with the aggregates in the mixer before cement is added. Cement shall not be added to mixtures of water and aggregate when the temperature of the mixture exceeds 70°F.

D. The temperature of the concrete, when discharged, shall not exceed 90°F. The Contractor is cautioned that difficulty may be encountered with concrete at temperatures approaching 90°F and every effort should be made to maintain it at lower temperatures.

3.02 FORMWORK

A. All formwork shall be in conformance with ACI 347. Forming is required for full depth deck repairs and joist, beam, wall, and column repairs to be constructed as a part of this project. The Contractor shall be responsible for the design and construction of all formwork.

B. Forms shall conform to the shape, lines, grade and dimensions of existing members and shall be braced and tied together to maintain their positions and shapes during the placement of concrete. Supports shall be spaced sufficiently close to prevent excessive deflection of the form material.

C. Forms shall be constructed of new 5/8 in. or ¾ in. 5-ply structural plywood of concrete form grade. Plywood that is in good condition may be reused for formed surfaces. The forms shall receive an oil-based form release agent prior to use. Metal or Styrofoam may also be used for formwork with the approval of the Architect/Engineer.

D. Special care shall be taken to obtain a seal between existing concrete construction and forms such that bleeding at form edges is held to a minimum and clean straight lines are left after stripping forms. Edges that are not clean and straight shall be ground, and smoothed with an approved overhead patching compound, if necessary, at the Contractor's expense to create the appearance of a straight surface.

E. Forms may be removed when field-cured cylinders achieve 75 percent of the specified 28-day compressive strength. It shall be the responsibility of the Contractor to make and pay for the costs of these supplemental strength tests.

F. After form removal, the Contractor shall grind smooth all concrete surface irregularities and fill bug holes to provide a smooth, sound finished surface.

3.03 PLACING

A. Before placing concrete, all equipment for mixing and transporting concrete shall be cleaned, vibrators shall be checked for workability, all frost, ice, mud, debris, and water shall be removed from concrete surfaces and forms, forms shall be thoroughly wetted or oiled, and reinforcement, floor drains and other slab embedments shall be securely tied in place and thoroughly cleaned of ice and other coatings which may destroy or reduce

bonding with concrete. No concrete shall be placed until the Architect/Engineer has approved the surface preparation and the condition and placement of reinforcement.

B. For repair areas where new concrete will be cast against existing concrete surfaces, wet the existing surface at least 1 hour prior to placement. Prior to placing the concrete, remove any standing or flowing water and allow the existing concrete surface to dry to a saturated, surface-dry condition. Immediately prior to placing the concrete, work a sand-cement slurry or the paste portion of the repair concrete mix into the concrete surfaces with a broom, a brush, or some other tool. If the paste dries before the concrete is placed, remove it and apply new paste. If the excess coarse aggregate cannot be absorbed into the patch concrete, remove and dispose of it. Do not allow water or the mortar to puddle.

C. All concrete placement work shall be performed when the outside temperature is below 85°F. When temperatures are above 85°F, the Contractor shall take whatever precautions are necessary to ensure the quality of the concrete placement, or said placement shall be postponed until the temperature is at or below 85°F.

D. Conveying the concrete from the mixer to the place of deposit shall not cause separation or loss of materials.

E. Placing of concrete shall be such that it shall be deposited as nearly as possible to its final position to avoid segregation due to rehandling or flowing. Placing shall be at such a rate that at all times concrete shall be plastic and flow readily into corners of forms and into spaces between reinforcing. No concrete that has partially hardened or has been contaminated by foreign materials shall be deposited. When concreting is commenced, it shall be carried on as a continuous operation until the panel or section is completed. When being deposited, concrete shall not be allowed to fall a vertical distance greater than 4 feet from point of discharge to point of deposit.

F. Concrete placement shall not disturb or displace reinforcing bars, welded wire fabric, floor drains, or other slab embedments.

G. Runways or another approved protection scheme shall be provided for reinforcing located in a pour or which extends into the pour, in order to prevent damage from moving equipment.

H. All newly placed concrete shall be thoroughly consolidated by means of vibration to assure dispelling of large voids and achieving ultimate contact between the fresh cement paste and existing concrete substrate. Generally, vibration shall be accomplished by means of an internal vibrator running at a minimum speed of 7000 rpm or higher, depending on the nature of the concrete being consolidated. Extra vibrators shall be kept at the project site to be used in case a vibrator does not work. Vibrators shall be as narrow as necessary for shallow work.

3.04 FINISHING

A. Placing and finishing equipment shall include adequate mechanized and hand tools for placement of concrete, for striking off at the correct grade, and for finishing to provide the required surface texture.

B. Slab surfaces to receive a membrane or to be exposed to vehicular or pedestrian traffic shall be finished with a wooden trowel in accordance with ACI 303, Par. 11.7.3, left free of loose particles, and shall be without ridges, projections, voids and concrete droppings. The surface shall conform to the finish requirements of the membrane manufacturer.

C. Maximum variation in top deck surface from planar shall be ¼ in. in 10 ft. If variations greater than this exist, the Architect/Engineer may direct the Contractor to grind the floor to bring the surface within requirements. Patching of low spots shall not be permitted. Grinding shall be done as soon as possible, preferably within 3 days, but not until concrete is sufficiently strong to prevent dislodging of coarse aggregate particles.

D. Slope of the finished surface shall be identical to the existing surface, except as directed by the Architect/Engineer. Finished surfaces shall slope to floor drains. Low spots away from drains shall be avoided.

3.05 CURING

A. Concrete shall be maintained above 55°F and in a moist condition for at least the first 7 days after placing or until the concrete has reached 75 percent of the specified 28-day compressive strength.

B. Curing shall be accomplished by burlap covers kept continuously wet, or continuous waterproof paper, or 4 mil polyethylene sheeting conforming to ASTM C171 with edges lapped and tightly sealed by sand, wood planks, pressure-sensitive tape, mastic, or glue. The burlap shall be kept continuously wet during the curing period. Alternatively, a curing compound meeting ASTM C309, Type 1, Class B may be used if approved by Architect/Engineer.

C. Adequate protection shall be provided for concrete during freezing or near freezing weather. All concrete materials, reinforcement, form, filler and ground with which concrete is to come in contact shall be free of rust, ice and snow. Whenever air temperature is below 40°F during the required curing period, the concrete shall be maintained at a temperature not less than 50°F. Throughout the heating period, concrete shall be kept moist as specified. Placement and curing of concrete during cold weather shall conform to requirements of ACI 306.1.

D. Placement and curing of concrete during hot weather shall be in conformance with the requirements of ACI 305.

E. If shrinkage cracks greater than 0.01 in., or in large numbers, appear in the concrete during the 7-day curing period, the concrete shall be considered defective, and it shall be removed and repaired by the Contractor at no extra cost to the Owner. All small cracks that exist but are not significant enough to require removal shall be sealed with cement slurry, at no extra cost to the Owner. Note: The Contractor is cautioned that exposure to wind may result in surface cracks.

3.06 LIMITATIONS OF OPERATIONS

A. No vehicular or construction traffic shall be permitted in a bay where a concrete deck pour occurred for at least 3 days or until the concrete has achieved at least 75 percent of its specified 28-day compressive strength, whichever is longer.

B. No power-driven tools heavier than 15-lb chipping hammer shall be permitted within 8 ft of a new patch for the first 36 hours after concrete placement.

3.07 FIELD QUALITY CONTROL

A. The Contractor will notify the test agency, Owner's Agent, and Architect/Engineer at least 24 hours before each concrete placement. The Contractor will cooperate fully with the testing agency in obtaining samples and performing onsite testing.

B. Testing of Concrete

1. The concrete testing agency will be hired and paid directly by the Owner.
2. A set of concrete field specimens shall be taken not less than once a day, nor less than once per each 20 cubic yards of concrete, nor less than 1,500 sq ft of surface area placed, whichever criteria results in more sets of field specimens.
3. All cylinders shall be made and tested by a qualified approved testing agency which meets the requirements of ASTM E329, and their reports will be sent to the Owner's Agent, the Architect/Engineer, and the Contractor.
4. A set of concrete field specimens shall consist of four 6 in. x 12 in. cylinders for typical concrete placements. One cylinder shall be tested at 7 days and the other two at 28 days. The fourth cylinder shall be held for future testing. All cylinders shall be made and cured in accordance with ASTM C31.
5. At the time each set of cylinder is made, the fresh concrete shall be tested for slump and air content. The temperature of concrete shall be taken at the same time cylinders are made. Slump tests shall be made in accordance with ASTM C143. Air content tests shall be made in accordance with ASTM C231. Additional slump and air content tests shall be performed at the request of the Architect/Engineer.

6. Samples of concrete for test specimens shall be taken from the transport vehicle or mixer during discharge. When, in the opinion of the Architect/Engineer, it is desirable to take samples elsewhere, they shall be taken as directed by him.

7. Concrete that fails to meet the slump or air content requirements shall be tested again using a different concrete test sample from the same source. If the second series of tests reveals the concrete does not meet the slump or air content requirements, the nonconforming concrete shall be rejected and properly disposed. A new batch of concrete shall be mixed or obtained at the Contractor's expense.

8. Test specimens shall be molded immediately after the sample is taken and then placed in on-site storage provided by the Contractor. Storage shall be in a shed, box or other enclosure maintained at a temperature of between 60°F and 80°F. Specimens shall be stored not less than 16 hours prior to removal to the laboratory.

9. Testing of cylinders shall be in accordance with ASTM C39. Each test report shall contain the following information for each set of cylinders:
   a. Individual test specimen strength, type of failure
   b. Slump
   c. Air content
   d. Concrete and air temperature
   e. Specimen number
   f. Portion of the structure represented by the concrete tested
   g. Date cast
   h. Date tested
   i. Concrete properties specified
   j. Compressive strength at 28 days
   k. Compressive breaking strength, and type of break for three (3), seven (7), and 28-day tests
   l. Notice if test indicate concrete is not in conformance with specifications.

10. Strength of concrete shall be considered satisfactory if the average of two 28-day tests in each set of cylinders equals or exceeds the specified 28-day strength, and neither of the 28-day tests is 500 psi or more below specified 28-day strength

11. Should the results of cylinder tests not meet the preceding requirements; the Contractor shall submit revised mix design data for concrete that will conform to the specifications. Also, the Contractor, at the Contractor's expense, shall have cores cut from that portion of the garage represented by the unsatisfactory test specimens. Three cores shall be taken from each area in question according to ASTM C42/C42M. Concrete in the area represented by the core tests will be considered to have sufficient strength if the average of the three cores is equal to at least 85 percent of required 28-day strength, and if no single core is less than 75 percent of the 28-day strength. If these strength acceptance criteria are not met by the core tests, the Contractor shall remove and repair all questionable areas of concrete at the Contractor's expense.

12. Additional cylinders may be made and tested at the Contractor's expense where it is desired to demonstrate 75 percent of the specified 28-day strength earlier than seven days

after placement, and where high early strength is expected. All cylinders to be tested earlier than 7 days shall be cured in the area in which the concrete is placed, and shall be removed from the area not more than 24 hours before the time of the test.

13. In the event of adverse weather conditions, the Architect/Engineer may have an additional set of concrete cylinders taken in addition to those already specified. These cylinders shall be stored in the vicinity of the area they represent and shall be cured in the same manner. The field-cured test cylinders shall be sent to the testing laboratory for testing as described in Par. 3.07.B.4 above. Field-cured cylinders shall remain in the area until 24 hours prior to being tested.

14. Laboratory-cured cylinders shall be labeled A, B, C, and D. Field-cured cylinders shall be labeled E, F, G and H. Cylinders A and E will be tested at 7 days. Cylinders B, C, F and G will be tested at 28 days. Cylinders D and H will be held for future additional testing.

15. Cost of additional field-cured cylinders, if tests indicate compliance with the specifications at the required 28-day compressive strength, shall be paid by the Owner. Otherwise, the Contractor shall pay the cost.

C. The Contractor shall sound the areas of work at the conclusion of concrete repairs to locate any delaminations in existing or repair concrete. Any delaminated repair concrete shall be removed and restored at no cost to the Owner.

END OF SECTION

SECTION 03 36 50

POLYMER-MODIFIED CONCRETE AND PATCHING MORTAR

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This work shall consist of providing the necessary labor, materials, equipment and supervision to place, cure and finish polymer-modified concrete and patching mortar which is placed over properly prepared existing concrete surfaces in repair areas on facade.

1.02 SUBMITTALS

A. Submit reports of concrete tests at the end of each day's testing as described in this section.

B. Submit a list of all proposed materials and material sources for the polymer-modified concrete and the patching mortar and submit test results to the Architect/Engineer at the start of the job, as detailed in Paragraphs 2.05 and 2.06 of this section of the Specifications.

C. Submit results of field tests required by Paragraph 3.06 of this section of the Specifications.

D. Submit required warranty.

E. Submit MSDS information as applicable.

1.03 WARRANTY

A. All concrete repairs shall be guaranteed for a period of three (3) years against all surface defects, delamination of the patch material from the substrate concrete, delamination within the patch material itself, and patch deterioration.

PART 2 - PRODUCTS

2.01 CONCRETE TYPES, STRENGTHS, AND USES

A. The strength indicated is 28-day design compressive strength.

Concrete Type	Strength	Use
Polymer-modified	5000 psi	Concrete for large patches

concrete

Patching mortar	5000 psi	Mortar for small patches (less than 1 1/2 in. deep and relatively small in plan)

2.02 MATERIALS

A. Portland Cement, ASTM C150, non-air-entraining Type 1. Portland Cement Type III is not permitted.

B. Admixtures: Either of the two following types of admixtures may be used, subject to the Architect's/Engineer's approval.

1. Acrylic Latex-Modifier - the acrylic latex-modifier shall be "Rhoplex E-330," as manufactured by the Rohm and Haas Company, Philadelphia, Pennsylvania, or equal.
2. Styrene-Butadiene Latex Emulsion - A nontoxic film-forming, polymeric emulsion in water to which all stabilizers have been added at the point of manufacture and shall be homogenous and uniform in composition. The latex shall be a styrene-butadiene polymeric emulsion in which the polymer comprises 46 to 50 percent of the total emulsion. The latex emulsion admixture shall be a product of the Dow Chemical Company, Midland, Michigan; Reichhold Chemicals, Inc., White Plains, New York; Tex-Crete Inc., Gurnee, Illinois, Thoro System Products, Centerville, Indiana, or an equivalent material which has received the approval of the Federal Highway Administration for use in concrete bridge deck overlays.

C. Calcium chloride shall not be permitted as an additive.

D. Fine and coarse aggregate shall be clean, sharp and dry and shall conform to the requirements of ASTM C33, Class 3S or 3N or 1N.

E. Water shall be potable, clean and free of injurious quantities of substances known to be harmful to Portland Cement.

2.03 POLYMER-MODIFIED MIX DESIGN

A. The primary requirements for the polymer-modified concrete mix are a minimum compressive strength as specified herein, workability that facilitates placement, and the achievement of the desired finish. The Contractor may use either styrene-butadiene or acrylic latex-modified concrete.

B. Water/cement ratio (including water in the latex emulsion or acrylic modifier and the aggregate) shall not exceed 0.40 by weight.

C. The entrained air content shall be allowed to vary from 0 to 6.5 percent, as measured according to ASTM C231. No air-entraining agent shall be added to the mix.

D. The following mix proportions are recommended for latex-modified concrete:

Material	Parts by Weight
Cement	1.0
Sand	2.1
Gravel (3/8 in. maximum)	2.1
Latex (46%-50% solids)	0.32
Water	As needed for 3 to 6 in slump
Defoamer	To the manufacturer's specifications

2.04 PATCHING MORTAR MIX DESIGN

A. The primary requirements for the patching mortar mix are a minimum compressive strength as specified herein, and workability that facilitates placement and achievement of the desired finish. The contractor may use a flexible epoxy gel mortar or a latex-modified Portland Cement mortar.

B. The patching mortar shall not be installed in layers, and shall not be installed in depths exceeding 1-1/2 inches.

C. The following mix proportions are recommended for the latex-modified portland cement mortar:

Material	Parts by Weight
Cement	1.0
Sand	3.0
Latex modifier (46-50% solids)	0.32
Water	As needed for workability
Defoamer	To the manufacturer's specifications

2.05 TESTING OF POLYMER-MODIFIED CONCRETE MIX DESIGNS

A. The Contractor shall submit a list of all proposed materials and material sources to the Architect/Engineer at the initiation of the project. The following data shall be submitted to the Architect/Engineer:

1. Sieve analysis for fine and coarse aggregate
2. Proposed mixing methods
3. Mill certificates for cement supplier

B. At least two (2) weeks prior to the start of concrete placement, the Contractor shall manufacture four (4) separately mixed test batches of concrete under job conditions, in quantities large enough to accommodate production of the following samples and tests:

1. Four sets of 3 in. x 6 in. test cylinders for use in determining compressive strength of the concrete
2. Two slump tests
3. Two air content tests

C. All samples and tests will be conducted by the Owner's Testing Agency (or by Architect/Engineer if so requested by Owner). The Contractor is responsible for providing the labor and materials to manufacture the concrete for the samples, and for disposal and cleanup of surplus materials.

D. During construction, tests will be made by an approved Testing Agency (or by Architect/Engineer if so requested by Owner) to determine if the concrete complies with the specified requirements. Cooperate in the making of such tests to the extent of allowing free access to the Work for the selection of samples and the storage of specimens, and in affording protection to specimens against injury or loss through his operations. Furnish all concrete for testing

E. The Owner and the Architect/Engineer reserve the right to request production of additional test batches of polymer-modified concrete if the material produced does not comply with these specifications.

F. Submit results of all required tests.

2.06 TESTING OF PATCHING MORTAR MIX DESIGNS

A. The Contractor shall notify the Architect/Engineer at least two (2) weeks in advance of the start of placement of patching mortar, in writing, of the type of patching mortar proposed for use on the project. The following data shall be submitted to the Architect/Engineer at that time.

1. List of material sources

2. Proposed mixing methods

B. At least two (2) weeks prior to the start of placement of patching mortar, the Contractor shall manufacture four (4) separately mixed test batches of patching mortar under job conditions in quantities large enough to accommodate the following samples and tests:

3. Eight, 2 inch cube specimens, for testing to determine compressive strength of the mortar in accordance with ASTM C109, "Standard Test Method for Compressive Strength of Hydraulic Cement Mortars."

4.
5. Eight flexural bar specimens, for testing to determine the flexural strength of the mortar in accordance with ASTM C348.
6.
7. Four specimens, for testing to determine set time of the mortar in accordance with ASTM C191.
8.

C. Submit results of all required tests.

2.07 MOCK-UP

A. A mock-up installation of each type of concrete repair and test panel is required as detailed in Specification Section 01455.

PART 3 - EXECUTION

3.01 BATCHING AND MIXING

A. All batching and mixing operations shall be developed in a manner such that quality control is guaranteed, accurate mix proportions are maintained and all ingredients are combined and mixed to a uniform consistency. All mixing and batching shall be done on the ground or on scaffolding platforms when only small quantities are involved. No concrete mixing or batching shall be done on roof of building.

B. Mix components shall be measured and partially combined in a controlled environment prior to final mixing and placing at the repair location.

C. If materials are to be mixed on scaffolding platforms at each repair location, crews shall be provided with quantities of partially combined ingredients such that all materials will be used up at the same time using the design mix proportions. If all of the materials will not be required at one patch location, the crew shall have accurately calibrated and clearly marked measuring containers for each mix component for use in batching smaller quantities of the design mix. Crews shall be fully instructed in the specific mix design proportions and in approved methods of batching materials.

D. If materials are to be mixed at a central location and then transported to the repair location for placement, the Contractor shall designate one or two individuals as qualified to batch and mix the concrete. These individuals shall be fully instructed in the specific mix design proportions and shall have full responsibility for achieving the design mix. No other persons shall batch or mix concrete without prior notification to the Architect/Engineer.

E. No polymer-modified concrete shall be placed at temperatures lower than 40°F or when the temperature is projected to fall below 40°F in the 24 hours following placement.

F. At temperatures above 85°F, the Architect/Engineer may require placements to be made at night or early morning hours, if in the Architect's/Engineer's opinion a satisfactory placement is not being achieved.

G. Water may be added to the polymer-modified concrete to obtain slump within the prescribed limits. Concrete with a slump less than 3 in. may be rejected if it is not placed satisfactorily and with a closed tight surface.

H. The outside bulk storage of latex emulsion in the sunlight shall be limited to 10 days or as required by the manufacturer's specifications if more stringent. The latex shall not be exposed to temperature extremes. The latex shall be agitated as required by the manufacturer.

3.02 SURFACE PREPARATION

A. Refer to Section 03930, Removal of Existing Concrete and Surface Preparation, for guidelines.

3.03 PLACING AND FINISHING CONCRETE

A. Before placing concrete, all equipment for mixing and transporting concrete shall be cleaned. Vibrators shall be checked for workability. All frost, ice, mud, debris, and water shall be removed from forms. Reinforcement shall be securely tied in place and thoroughly cleaned of ice and other coatings that may destroy or reduce bonding with concrete. No concrete shall be placed until the Architect/Engineer has reviewed and approved the forms and condition and placement of reinforcement. Conveying the concrete from mixer to place of deposit shall not cause separation or loss of materials.

B. All surfaces shall be approved by the Architect/Engineer prior to placing concrete.

C. Placing of concrete shall be such that it shall be deposited as nearly as possible in its final position to avoid segregation due to re-handling or flowing. Placing shall be at such a rate that at all times concrete shall be plastic and flow readily into corners of forms and into spaces between reinforcement. No concrete that has partially hardened or that has been contaminated by foreign materials shall be deposited. When being deposited, concrete shall not be allowed to fall a vertical distance greater than 4 ft from point of discharge to point of deposit. Pencil vibrators shall be used, as appropriate, to insure that proper consolidation of the concrete is achieved.

D. Placement of the polymer-modified concrete shall be a continuous operation at each patch location. Materials sufficient to complete a patch shall be available prior to commencing a repair.

E. The concrete shall be continuously rodded or vibrated with pencil vibrators during placement to consolidate the pour and fill all corners of the patch. External vibration of the formwork may also be used, by placing the pencil vibrators against the wood forms.

F. Allow sufficient space at the top of the formed area in order to properly place and consolidate the concrete. This space will be dry-packed with patching mortar following the concrete pour. It is important that this space have no cross sectional dimension in excess of 1½ in., if possible, to avoid layering of the patching mortar.

G. The aggregate could be exposed using either a Scrubbed Finish or a Sandblast Finish.

1. With the scrubbed finish, the exposure of the aggregate shall start after the matrix has hardened sufficiently to prevent dislodgment of the aggregate. Water, in abundant quantities but without force, shall be allowed to flow over the surface of the concrete while the matrix encasing the selected aggregate is removed by brushing with a fine bristle brush until the selected aggregate is exposed, but not dislodged.

2. Chemical retarder approved by the Architect/Engineer may be sprayed onto the form surface following the manufacturer's recommendations to extend the working time for exposure of aggregate.

3. With the sandblast finish the concrete surface shall be lightly sandblasted. This shall expose the fine aggregate with some occasional coarse aggregate, which should not project more than 1/16 in. from the matrix.

3.04 PLACING AND FINISHING MORTAR PATCHES

A. After the surface water has evaporated from the area to be patched or has been blown dry, the latex-modified patch material shall be thoroughly scrubbed into the sides and bottom of the excavations. This slurry shall be fresh at time of deposition of concrete.

B. The mortar shall not be used for patches greater than 1½ in. in thickness.

C. The mortar shall be thoroughly consolidated into place and struck off to the level of surrounding concrete. Apply curing compound within 30 min. of finishing.

3.05 CURING

A. Concrete shall be maintained above 50°F and in a moist condition for at least the first 7 days after placing.

B. After finishing, the concrete shall be promptly covered with a single layer of clean, wet burlap. Care shall be exercised to insure that the burlap is well drained, and that it is placed as soon as the surface will support it without deformation. Immediately following covering with wet burlap, a layer of polyethylene film (minimum 4 mil) shall be placed on the wet burlap with edges and laps and tightly sealed by wood planks, pressure sensitive tape, mastic or glue. The burlap shall be kept continuously wet during the curing period.

C. If shrinkage cracks greater than 0.01 in., or in large numbers, appear in the concrete during the 7-day curing period, the concrete shall be considered defective, and it shall be removed and replaced by the Contractor at no extra cost to the Owner. Note: The Contractor is cautioned that exposure to wind may result in surface cracks.

D. Selected concrete shall be sounded by the Contractor in the presence of the Architect/Engineer with a hammer after the 7 day cure and any hollowness shall be corrected by the Contractor by removing the concrete at these locations and recasting at no extra cost to the Owner.

E. After finishing and curing, the Contractor shall check the surface with a straightedge; the Contractor shall eliminate causes of non-conformance with the Specification.

F. Placement and curing of concrete during hot weather shall be in conformance to the requirements of ACI 305. During cold weather, placement and curing shall conform to the requirements of ACI 306.1.

G. Concrete curing with curing compounds shall be in conformance with a standard specification for liquid membrane-forming compounds for curing concrete (ASTM C309, Type 1, Class B). Concrete curing compound shall be compatible with sealer and approved by the sealer and coating manufacturer (Specification Section 07190).

3.06 FIELD QUALITY CONTROL

A. Testing of Concrete and Mortar

1. At the time of the first field placement of concrete and mortar, and at least four appropriate intervals as directed by the Architect/Engineer, four standard 3 x 6 cylinders will be made, cured and tested in accordance with ACI 318, except as noted herein.
2. All cylinders shall be tested by a qualified approved testing laboratory that meets the requirements of ASTM E329, and their reports sent to the Architect/Engineer and the Contractor. Costs for these tests will be paid for by the Owner. The Testing Laboratory will be responsible for making these cylinders and for seeing that they are transmitted to

the testing laboratory. The Contractor shall provide the necessary concrete to make the cylinders.

3. All four cylinders should be cured under field conditions for one day. The cylinders shall then be transported to the testing agency laboratory and cured in air at 73°F, 50 percent RH. One cylinder should be tested for compressive strength at 7 days and two at 28 days. One cylinder shall be stored for potential future testing.
4. For each set of cylinders made, a slump and air content test shall also be made. The temperature of the concrete shall be taken at the same time cylinders are made. Slump tests shall be made in accordance with ASTM C143. Air content tests shall be made in accordance with ASTM C231.
5. Testing of cylinders shall be in accordance with ASTM C39, and shall be conducted by the Testing Laboratory. Each test report shall contain the following information for each set of cylinders:
    a. Individual test specimen strength, type of failure
    b. Slump
    c. Air content
    d. Concrete and air temperature
    e. Specimen number
    f. Portion of structure represented by the concrete tested
    g. Date cast
    h. Date tested
    i. Concrete properties specified
    j. Compressive strength at 28 days
    k. Compressive breaking strength, and type of break for three (3), seven (7), and 28-day tests
    l. Notice if tests indicate concrete is not in conformance with specifications
6. Strength shall be considered satisfactory if the average of the two 28-day tests meets or exceeds 5000 psi, and neither of the 28-day tests is below 4500 psi.

B. Coring

1. At the direction of the Architect/Engineer, the Contractor will take 2-in. diameter core samples from completed patches. The Contractor should allow for the taking of at least three separate cores at random locations on the building. These samples will be drilled into the underlying original concrete and the cores removed intact for visual inspection. If no other testing is required, the Contractor shall fill the core holes with patching mortar. Any additional testing of these core samples will be performed under the direction of the Architect/Engineer. The cost of these additional tests will be paid for by the Owner.

3.07 PROTECTION OF WORK

A. Protect building from slurry generated during repair operations. Do not allow slurry to contact glass surfaces. Do not allow water runoff to contact glass.

END OF SECTION

SECTION 03 60 30

EPOXIED-IN ANCHORS AND FIELD COATING OF STEEL WITH EPOXY

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This work shall consist of providing the necessary labor, materials, equipment and supervision to install epoxied-in anchors and to coat exposed reinforcing bars and other embedded steel with epoxy.

B. Definition

1. Epoxied-in anchor: The completed assembly of a reinforcing bar or stainless steel dowel surrounded by epoxy within the drilled hole.

1.02 QUALITY ASSURANCE

A. Applicator Qualifications

1. The Contractor shall have three years of experience in performing work similar to that shown on the Drawings and described in these Specifications.

2. An on-site supervisor shall be provided by the Contractor for the duration of the epoxied-in anchor work. This supervisor shall have had 2 years documented supervisory experience with the products to be used.

1.03 SUBMITTALS

A. The Contractor shall submit the following to the Architect/Engineer:

1. Technical data sheets for each epoxy product or formulation to be used showing that products meet the requirements of the specifications. Technical data shall include:

a. Intended use
b. Pot life (neat)
c. Initial cure time (1000 psi)
d. Tack free (thin film)
e. Final cure (75% ultimate strength)
f. Tensile strengths by ASTM D638 (14 days)
g. Tensile elongation by ASTM D638 modified (14 days)
h. Flexural strength and modulus per ASTM D790 at 24 hrs, 3 days, and 7 days at 77^{o}F
i. 24-hr compressive strength by ASTM C109 modified (1 part epoxy to 3-1/4 parts aggregate)
j. Heat deflection temperature by ASTM D648

k. Slant shear by AASHTO 237
2. MSDS information for each epoxy.

1.04 PRODUCT DELIVERY

A. The product shall be delivered, stored and handled according to the manufacturer's recommendations.
B. Damaged, open containers shall not be used.

1.05 JOB CONDITIONS

A. Existing and environmental conditions: Examine the condition of surfaces where epoxied-in anchors are required and follow the recommendations of the manufacturer with regard to limitations of the materials in various moisture and temperature conditions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Epoxy for Anchors: Concressive 1411 as manufactured by Adhesive Engineering Company, or Hilti HY150 by Hilti, Corp.

B. Epoxy Coating for Steel Reinforcing Bars: Skotchkote 309 by 3M or Sikadur 32 Hi-Mod by Sika Corporation.

C. Stainless Steel Anchors: Type 304, ¼ in. diameter stainless steel threaded rods cut and bent to shapes indicated on Drawings.
1. Maximum yield strength - 30 ksi
2. Minimum tensile strength - 75 ksi

2.02 TOLERANCES

A. Install epoxied-in dowels such that the depth of the hole and the concrete clear cover falls within +0 to -1/4 in. of the specified dimension.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine surfaces where epoxied-in anchors are to be installed for unsound concrete that would adversely affect the execution and quality of work.

B. Where such conditions are found, notify the Architect/Engineer and proceed with work at other locations.

3.02 PREPARATION

A. Lay out the locations of epoxied-in anchors according to the Drawings and Specifications.

B. The Contractor is advised to use a magnetic detector to avoid drilling into existing embedded reinforcing.

3.03 INSTALLATION OF STAINLESS STEEL ANCHORS

A. Drilling holes:

1. Dry drill hole using approved equipment and methods. Scrub out the hole with a stiff brush and blow out hole using dry, oil-free compressed air to remove all loose concrete, dust, and debris.
2. Holes shall be approximately 3/8 in. diameter.

B. Stainless steel anchors shall be dry and free from contaminants, such as dirt, oil, and grease.

C. Proportioning and mixing:

1. Mix the components of the epoxy in proper proportions according to the manufacturer's directions. Scrape out the entire contents of both cans to assure accurate proportions, if applicable.
2. Mix the contents with a paint stirrer attached to a low-speed (400-600 rpm) electric or pneumatic drill for about 3 minutes. Move the stirrer up and down and around the sides until an even streak-free color is obtained. Do not whip in air.

D. Installation:

1. The epoxied-in anchors shall be installed by batch mixing and injection of a pre-measured quantity of epoxy to the back of the hole and insertion of the stainless steel anchor.
2. The method of installation is intended to achieve 100 percent filling of the annular space between the anchor and the drilled hole.
3. Use one of the following methods:
    a. Suction tube: This is a simple tube of a size that will fit inside the anchor hole. The tube is fitted with an inner tube, or plunger, that has a screw, approximately 3-in. long, attached to one end. Approximately 3 rubber washers, alternated with smaller metal washers are attached to the end of the machine screw. The rubber washers must be in contact with the inner surface of the outer tube to provide an airtight seal.
        1) Place the open end of the outer tube into the mixed epoxy and suck the material into the tube by slowly pulling out the plunger tube. When filled, remove the tube, leaving the plunger in place and wipe off excess epoxy.

2) Insert the filled tube to the back of the anchor hole. Slowly withdraw the outer tube with one hand while keeping firm pressure on the plunger with the other hand. Note: Only partially fill the hole. Calibrate the tube for the estimated volume of grout for the hole with a piece of tape around the outside of the plunger tube.
3) Insert the anchor into the filled hole while slowly working it back and forth to assist removal of air. Insert small wooden wedges into the hole to position the anchor temporarily until the grout has set or gelled.

b. Hand Operated Caulk Gun. The caulk gun should be fitted with a wide tip opening and a length of polyethylene or copper tubing matching the depth of the anchor hole.
1) Fill the gun with epoxy in the same manner as for sealant.
2) Place the extension tube to the back of the anchor hole. Begin injection evenly, while slowly with drawing the tube.
3) Insert the anchor as above.

3.04 SURFACE PREPARATION FOR EXPOSED STEEL

A. The exposed steel shall be prepared in accordance with Specification Section 03930.

B. The time between blast cleaning and coating of the bars shall not be more than approximately eight hours without specific approval of the Architect/Engineer.

3.05 FIELD COATING EXISTING EXPOSED STEEL WITH EPOXY

A. Fully coat all portions of existing exposed steel including the underside, with two coats of epoxy that cover the reinforcement with no pin holes or holidays. A touch-up coat shall be applied if pin holes or holidays remain after the second coat. The dry film thickness of the coating shall be approximately 10 to 12 mils.

B. Avoid spilling epoxy on the concrete substrate. Remove any spillage by solvents or additional chipping of the concrete.

C. Do not place mortar or concrete in contact with epoxy coated steel until epoxy has adequately cured per the epoxy manufacturer's recommendations.

3.06 CLEAN-UP AND SAFETY

A. The epoxied-in anchors shall be cleanly installed and squared up as shown on the Drawings. Excess epoxy shall be cleaned up. Wood shims shall be removed.

B. Safety of Personnel:

1. Avoid skin contact with epoxy materials, solvents and epoxy strippers. Epoxy resins and particularly epoxy hardeners may cause skin sensitization.

2. Wear rubber gloves (preferably with a cloth liner) and protective clothing. Where splashing may occur, wear goggles or face shields. Barrier creams are recommended but do not substitute for protective clothing.
3. If skin contact occurs, wash immediately with a waterless cleaner, followed by soap and water. Should eye contact occur, flush immediately with plenty of water for 15 minutes and call a physician.

END OF SECTION

DIVISION 4 - MASONRY

SECTION 04 10 00

MORTAR

PART 1 - GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, tools and equipment and perform all Work necessary for and incidental to providing materials and mixing mortar as shown on the Drawings and specified herein; in accordance with the provisions of the Contract Requirements -Division 0, General Requirements - Division 1 and completely coordinated with the Work of all other trades.

B. Work of this section shall include:

1. Mixing and placement of mortar to be used for masonry replacement at shelf angle/expansion joint/flashing repairs.
2. Mixing and placement of mortar to be used to replace any spalled, cracked or otherwise damaged masonry units that are indicated to be replaced in conjunction with spot replacement of masonry and at crack repairs.
3. Mixing and placement of mortar to be used for brick and stone masonry repointing (tuckpointing)
4. Miscellaneous work specified in the Contract Documents

C. Related requirements specified elsewhere:

1. Section 02 41 10 - Selective Demolition
2. Section 04 20 00 - Brick Masonry
3. Section 04 45 00 – Brick and Stone Masonry Repointing (Tuckpointing)

1.02 REFERENCES

A. Except as modified by the Project Specifications, applicable portions of the following reference standards shall govern the Work.

1. ASTM C144 - Specifications for Aggregate for Masonry Mortar
2. ASTM C150 - Specifications for Portland Cement
3. ASTM C207 - Specifications for Hydrated Lime for Masonry Purposes
4. ASTM C270 - Specifications for Mortar for Unit Masonry.

B. Except as modified by the Project Specifications, applicable portions of the following reference documents shall govern the Work.

1. Brick Institute of America (BIA) Technical Note 8A - "Standard Specification for Portland Cement-Lime Mortar for Brick Masonry, BIA Designation M1-88"

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 53 23.

1. Manufacturer's Literature: Materials description for all materials to be used for the Work
2. Certifications: Prior to delivery, submit to the Owner and Owner's representative certificates attesting to compliance with the applicable Specifications referenced herein
3. Test Reports: Test reports from an independent laboratory for all required tests.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Contractor: Must have a minimum of five (5) years of experience in construction and supervision of brick masonry Work
2. Mixers: Must have a minimum of two (2) years of experience in preparation of masonry mortar. Apprentices must be fully supervised by an experienced tradesman.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in manufacturer's sealed packaging and store unopened until required for use.

B. Store packaged materials above ground on platforms permitting air circulation under materials.

C. Completely cover all materials to protect from weather, moisture and neglect.

PART 2 - PRODUCTS

2.03 MATERIALS

A. Cementitious Materials (MASONRY CEMENTS WILL NOT BE ALLOWED):

1. Portland Cement: ASTM C150, Type I
2. Hydrated Lime: ASTM C207, Type S.

B. Sand:

1. ASTM C144 except that the grading shall comply with the limits specified in Section 3.3 of BIA Technical Note 8A. Sand shall contain no more than 150 parts per million of chloride ions. Sand shall be free of organic contaminants.

C. Mixing Water:

1. Water must be clean and free from deleterious amounts of acids, alkalis or organic materials

D. Admixtures:

1. No calcium chloride or admixtures containing calcium chloride shall be used in the mortar or grout
2. No air-entraining admixtures or material containing air-entraining admixtures shall be used in mortar
3. No antifreeze compounds or other substances shall be added to mortar to increase hydration rates or prevent freezing
4. No admixtures shall be used without written approval.

2.04 MIXES

A. Mortar Mix:

1. ASTM C 270 Type N Portland Cement/lime with the following material mix proportion by volume:

Portland Cement:	1 part
Hydrated Lime:	1 part
Sand:	4 1/2 to 6 parts

2. Color of mortar shall match existing mortar. Use colored aggregates to obtain desired mortar color. If appropriately colored aggregates are not available for desired mortar color, use colored mortar pigments made from metallic oxides. Use the minimum quantity of pigments that will produce the desired results; an excess may seriously impair strength and durability. The maximum permissible quantity of most metallic oxide pigments is about 10 to 15 percent of the cement content by weight. If used, carbon black pigment shall not exceed 2 to 3 percent of cement by weight. For best results, premix color pigments with Portland cement in large, controlled quantities to obtain uniform color.

PART 3 - EXECUTION

3.03 MIXING

A. Except as specified herein, mix in accordance with requirements of BIA M1.

B. Control batching procedure to insure proper proportions by measuring materials by volume. Premixed bag mortars are acceptable provided they contain only the materials and proportions specified herein. Do not measure mortar materials by shovels. All mortar must be measured using containers of known quantity that are filled to the top and leveled. All mortar is to be mixed in a mechanical mixer.

C. Mortar for installation of masonry units:

1. Type N mortar specified above shall be used. Mix all cementitious materials, aggregate and water in a mechanical batch mixer using the maximum amount of water to produce a workable consistency. Mix a minimum of three minutes and a maximum of five minutes. Also follow the mixing requirements of BIA M1. Retemper only as necessary for the required consistency. Add water to replace that which has evaporated.

D. Mortar mixing for repointing and for filling small voids:

1. Type N mortar specified above shall be used. Prehydrate the mortar by thoroughly mixing all the dry ingredients. Then, mix again adding only enough water to produce a damp mix, which will retain its form when pressed into a ball. After keeping the mortar in this dampened condition for one hour, add enough water to bring it to proper consistency. Mortar may be retempered by adding water and remixing, as required for workability.

E. All mortar shall be discarded 2 1/2 hours after initial mixing.

3.04 CLEANING

A. At the conclusion of masonry work remove all equipment and surplus material used for mixing mortar, clean up all debris and refuse and remove same from the site.

B. See Section 04 20 00 for masonry surface cleaning.

END OF SECTION

SECTION 04 20 00

BRICK MASONRY

PART 1 - GENERAL

1.01 DESCRIPTION

A. Furnish all labor, materials, tools and equipment and perform all Work necessary for and incidental to the installation of brick masonry as shown on the Drawings and specified herein; in accordance with the provisions of the Contract and completely coordinated with the Work of all other trades.

B. Work of this section shall include:

1. Brick masonry replacement associated with the replacement of the shelf angle/flashing repair.
2. Rebuilding of brick masonry parapet walls.
3. Selective replacement of masonry units

C. Related requirements specified elsewhere:

1. Section 01 53 23 - Submittals (Shop Drawings, Product Data, and Samples)
2. Section 02 41 10 - Selective Demolition
3. Section 04 10 00 – Mortar
4. Section 04 45 00 – Brick And Stone Masonry Repointing (Tuckpointing)
5. Section 05 10 00 – Steel Angles
6. Section 07 60 00 - Flashing and Sheet Metal
7. Section 07 92 00 - Sealants and Caulking

1.02 QUALITY ASSURANCE

A. Qualifications:

1. Contractor: Must have a minimum of five (5) years of experience in construction or supervision of brick masonry restoration work
2. Bricklayers: Must have a minimum of two (2) years of experience in construction of brick masonry restoration Work, except for the required apprentices who shall be supervised by experienced bricklayers.

B. Reference Standards:

1. Except as modified by this Section, the Work shall conform to the latest standards of the Brick Institute of America (BIA).
2. The Work shall conform to the latest addition of specifications for Masonry Structures, ACI 530.1/ASCE6/TMS 602.

C. Brick Testing:

1. Representative portion of each type of brick provided for Work under this Section shall be tested in accordance with ASTM C 67, latest edition. Test reports shall not be older than 12 months old.
2. Tests may be requested by the Owner after delivery of units. Cost of such tests after delivery of units and certification specified herein shall be borne by the Owner unless such tests indicate that the units do not conform to the requirements of the Specifications, in which case the cost shall be borne by the Contractor.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 53 23.

1. Manufacturer's Literature: Materials description and installation instructions for limestone patching material and any built in accessories, cleaning agents, coatings, etc. to be used for the Work.
2. Certifications: Prior to delivery, submit to the Owner and Owner's Representative certificates attesting to compliance with the applicable Specifications referenced herein.
3. Test Reports for Brick: Test reports from an independent laboratory for facing brick to be incorporated in the Work showing:
   a. Compressive strength per ASTM C67
   b. 24 hour cold water absorption per ASTM C67
   c. 5 hour boil absorption per ASTM C67
   d. Saturation coefficient per ASTM C67
   e. Initial rate of absorption (suction) per ASTM C67
   f. Efflorescence per ASTM C67.
4. Samples:
   a. Furnish not less than five individual bricks for one potential brick unit types selected by the Contractor. The five bricks shall show extremes of variation in color and texture. Brick type to be approved by the Owner and Owner's Representative.
   b. Submit cured samples of the mortar for approval of color and finish.

1.04 PRODUCT DELIVERY, HANDLING AND STORAGE

A. Deliver and handle materials in such a manner as to prevent damage. Store masonry units, accessories and packaged material above ground on wood pallets or blocking and protect from the weather until used. All damaged or otherwise unsuitable material shall be removed from the job site.

B. Store all packaged materials in their original containers.

C. Protect materials during storage and construction. Keep containers tightly closed and away from damage. Protect liquid components from freezing. Comply with manufacturer's recommendations for minimum and maximum temperature requirements for storage.

D. Comply with manufacturer’s recommendations for handling epoxy materials.

1.05 JOB CONDITIONS

A. Protection

1. Wall covering:
   a. During erection, cover all openings in walls with strong waterproof membrane at end of each day or shutdown
   b. Cover partially completed walls when Work is not in progress
   c. Extend cover minimum of 24 in. beyond each side of openings in walls
   d. Hold cover securely in place.

B. Staining:

1. Prevent mortar from staining window and door frames and the face of masonry to be left exposed.
   a. Remove immediately mortar in contact with window and door frames and with face of such masonry
   b. Protect all window and door frames, sills, ledges and projections from droppings of mortar; protect window and door frames and corners from damage during construction.

C. Precautions:

1. No masonry work is to be performed when the ambient air temperature is less than or is expected to be less than 40° F unless written permission has been granted by the Owner.

D. Damaged or defective work

1. Repair masonry construction where required due to damaged or defective Work and where required to accommodate Work of other trades, in an approved manner so that patching is not visually apparent.

PART 2 - PRODUCTS

2.04 MASONRY UNITS

A. Face Brick:

1. The units shall conform to ASTM C 216 for Grade SW units.
2. Initial rate of absorption for units shall not be greater than 20 grams/30 sq in./min. unless permitted in writing by Owner's representative
3. Efflorescence potential for units shall be rated as "No Efflorescence" per ASTM C 67

4. Dimensions: Shall match existing except at flashing repair areas units are to be 3 in. wide as shown on the Drawings.
5. Minimum compressive strength = 5000 psi
6. Color and finish of face brick shall be the same as existing bricks in building and shall be approved by Owner on sample panels.
7. Do not exceed variations in color and texture of samples accepted by the Owner and Owner's representative on the sample panel
8. Units shall not have coatings of any kind applied to the surfaces by any means without the written permission of the Licensed Engineer.

2.05 MASONRY WALL ANCHORS AND TIES

A. Wall Ties: Ties at areas of brick replacement (for rebuilding exterior wythe only): D/A 5801 adjustable veneer tie manufactured by Dur-O-Wal. Ties are to be completely manufactured of Type 304 Stainless steel. Anchor to attach tie to back-up is to be Dur-O-Wal expansion anchor consisting of brass expanding cone and stainless steel bolt. Embedment is to be 1 9/16 in. minimum.

B. Remedial masonry anchor: Dry fix Helifix stainless steel ties distributed by Helifix North America Corporation in Ontario, Canada. Ties shall be 10 mm

2.06 WEEP VENTS

A. Weep Vents: shall be Cell Vent manufactured by Dur-O-Wal Inc.

2.07 SEALANT

A. Sealant shall be as specified in Section 07 92 00 – Sealants and Caulking, and shall match color of the brick as selected by the Architect/Engineer.

2.08 STEEL ANGLES

A. Steel Angles: shall be hot-dipped galvanized angles as shown on the drawings and described in Section 5100.

2.09 FLASHING

A. Flashing is specified in Section 07 60 00.

PART 3 - EXECUTION

3.04 GENERAL ERECTION REQUIREMENTS

A. Bond Pattern:

1. Bond pattern of new brickwork shall match existing brickwork on building.

B. Joining of Work:

1. Where fresh masonry joins partially set or existing masonry:
   a. Remove loose brick and mortar.
2. Stop horizontal run of masonry by raking back half length of unit in each course
3. When removing damaged existing brick, care shall be taken to avoid damaging adjacent sound brick.
4. All existing sound, bricks which are damaged, shall be removed and replaced by the Contractor at his expense.
5. Prior to the beginning of the repair Work, the Contractor shall document and show to the Owner and Owner's Representative defects in the brickwork that require repair that are not indicated in the Contract Documents.

C. Tooling

1. Tool exposed joints when "thumbprint" hard
2. Tool exposed exterior joints to match existing joints.

D. Cutting Masonry:

1. Cut exposed masonry with motor-driven saw.

E. Mortar Joint Thickness:

1. Lay all brick with joint to match existing except as shown on drawings for special conditions.

3.05 INSTALLATION OF SHELF ANGLES

A. Installation of shelf angles is shown on the drawings and specified in Section 05 10 00.

3.06 INSTALLATION OF FLASHING

A. Flashing installation shall be as shown on the drawings and specified in Section 07 60 00.

3.07 ERECTION OF MASONRY

A. Brick Installation:

1. Brick installation shall conform to that specified in the current addition of Specifications for Masonry Structures, ACI 530.1/ASCE 6/TMS 602 or herein, whichever is more conservative.
2. Lay brick as plumb and true to line as adjacent surfaces will permit
3. New brickwork shall be flush with existing brickwork
4. Lay brick with completely filled head and bed mortar joints
5. Do not furrow bed joints

6. Butter ends of brick with sufficient mortar to fill head joints
7. Do not pound corners and jambs to fit stretcher units after they are set in position. Where an adjustment must be made after mortar has started to harden, remove mortar and replace with fresh mortar.

B. Install weep vents at 24 in. o.c. along top surface of flashing as shown on the drawings

C. Space Between New Masonry and Backup

1. Keep air space open by:
   a. Sloping bed joints down towards cavity to prevent the majority of mortar from extruding into cavity when units are placed.
   b. As Work progresses, trowel any protruding mortar fins in cavity flat onto inner face of wythe.

D. Anchoring

1. Anchor brick above and below new shelf angle repair as shown on the drawings with remedial masonry anchors as follows:
   a. Manufacturer's representative shall perform field tests to determine pilot hold size and complete installation procedures.
   b. Drill pilot hole through masonry into the backup using the hole size and depth determined by the manufacturer's representative. Use only rotary percussion drills (3 jaw chuck type). Manufacturer's representative shall perform field tests to determine pilot hole size and complete installation procedures.
   c. Load DryFix masonry tie into special insertion tool provided by manufacturer.
   d. Drive tie into position using an electric hammer drill (SDS type) to a recessed depth
   e. Fill entry hole with repointing mortar specified in Section 04 10 00.
2. Anchor new exterior brick veneer to new and existing walls or members with wall ties as shown on the Drawings and specified below:
   a. Space wall ties at 16 in. o.c. vertically and horizontally and as shown on Drawings. One half spaces shall be used at the top or bottom of any wall section and at any ends
   b. Embed metal ties such that the distance between the end of the tie and the exterior face of the new brick veneer shall be 3/4 in. minimum and 1 3/4 in. maximum
   c. Locate metal ties in the middle of the thickness of the horizontal mortar joints of the brick veneer
   d. Keep space free of mortar or other rigid material to permit differential movement.

3.04 CLEANING NEW MASONRY AND OTHER BRICK WALL SURFACES

A. Clean all exposed masonry:

1. Note that the method specified for cleaning exterior masonry does not dissolve cured mortar. Care must be taken to avoid getting mortar on the face of units.

2. Apply cleaning agent to sample wall area of 10 sq ft or as practical in location acceptable to the Owner and Owner's Representative.
3. Do not proceed with cleaning until sample area is approved by Owner and Owner's Representative.
4. Clean all new brickwork. Remove large particles of mortar with wood paddles and scrapers before wetting the wall. In some instances, it may be necessary to use a chisel.
5. Saturate the brickwork with water and flush off all loose mortar and dirt. Scrub down walls with a solution of one-half cup trisodium phosphate (Calgon) and a half cup household detergent dissolved in one gallon of clear water. Scrub with stiff fiber brush. Thoroughly wash off all cleaning solution, dirt and mortar crumbs using clean, pressurized water. Note, this cleaning procedure does not dissolve harden mortar. Care must be taken during construction to prevent mortar from being deposited on brick faces.
6. A poultice made from a solution of sodium hydrosulphite and an inert powder (talc) shall be used for the removal of iron rust stain. Apply poultice with trowel. Scrape off when dry. Repeat until stain has disappeared and wash thoroughly with clear water.
7. Clean windows, curtain walls, grills and other similar items in the areas where the brickwork is required to be cleaned.

3.05 CLEAN UP

A. At the conclusion of masonry restoration work remove all scaffolding and equipment used in the Work, clean up all debris, refuse and surplus material and remove same from the premises.

END OF SECTION

SECTION 04 20 22

CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Furnish all labor, materials, tools and equipment and perform all Work necessary for and incidental to the installation of concrete unit masonry as shown on the drawings and specified herein. This includes but is not limited to the following:

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 04 10 00 – Mortar and Grout

1.03 REFERENCES

A. Except as modified by the Project Specifications, applicable portions of the following reference standards shall govern the Work.
   1. ACI 530 – Building Code Requirements for Masonry Structures
   2. ACI 530.1 – Specification for Masonry Structures
   3. ASTM C 90 – Specification for Hollow Load Bearing Concrete Masonry Units
   4. ASTM C 426 – Test Method for Drying Shrinkage of Concrete Block

B. Except as modified by the Project Specifications, applicable portions of the following reference documents shall govern the Work.

   1. National Concrete Masonry Association "NCMA-TEK 3-1A – All Weather Concrete Masonry Construction"

1.04 SUBMITTALS

A. Submit the following:
   1. Certification: Furnish test reports, or other acceptable evidence to indicate compliance with requirements for masonry units.

1.05 QUALITY ASSURANCE

A. Qualifications
   1. Contractor: Must have a minimum of five (5) years of experience in construction or supervision of masonry Work.
   2. Masons: Must have a minimum of two (2) years of experience in construction of masonry Work, except for the required apprentices who shall be supervised by experienced masons.

B. Comply with all laws, ordinances, rules, regulations and orders of public authorities having jurisdiction over this part of the Work.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver and handle materials in such a manner as to prevent damage. Store concrete unit masonry and packaged material above ground on wood pallets or blocking and protect from the weather until used. All damaged or otherwise unsuitable material, when so ascertained, shall be immediately removed from the job site.

1.07 JOB CONDITIONS

A. Temperature: During cold weather perform masonry Work in accordance with NCMA-TEK 3-1A.

B. Protection
   1. During erection, cover all openings in walls with strong waterproof membrane at end of each day or shutdown.
   2. Cover partially completed walls when Work is not in progress.
   3. Extend cover minimum of 24 in. beyond each side of openings in walls.
   4. Hold cover securely in place.

C. Staining: Prevent mortar from staining window and door frames and the face of masonry to be left exposed.

   1. Remove immediately mortar in contact with window and door frames and with face of such masonry.
   2. Protect all window and door frames, sills, ledges and projections from droppings of mortar; protect window and door frames and corners from damage during construction.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete Masonry Units:
   1. Aggregate: Normal weight in accordance with ASTM C33.
   2. Hollow Units: ASTM C 90.
   3. Size: Faces of units shall be nominal 8 in. x 16 in. unless otherwise shown; thickness shall be as shown, or required by code.

B. Mortar: As specified in Section 04 10 00.

C. Horizontal Joint Reinforcing
   1. “DA 320 Ladur” type material fabricated from Type 304 stainless steel wire, minimum 9 gage side as manufactured by Dur-O-Wal.
   2. Width shall be 1 in. less than wall thickness.
   3. Provide prefabricated corners and tee Sections.

D. D. Reinforcing steel: All reinforcing steel shall be Grade 60 (60,000 psi yield strength) as defined in ASTM A615. All reinforcing to be used shall be epoxy-coated. The coating shall consist of a protective coating of epoxy applied by electrostatic spray method or electrostatic fluidized-bed method in accordance with the resin manufacturer's recommendations and these specifications.

E. Epoxy: For setting steel bars and dowels into existing concrete, “Power-Fast” epoxy injection gel sold by Powers/Rawl-Powers Fastening, Inc.

PART 3 - EXECUTION

3.01 PREPARATION

A. Examine all surfaces to receive the parts of the Work specified herein. Verify all dimensions of in-place and subsequent construction. Application or installation of materials constitutes acceptance of the adjacent and underlying construction.

3.02 INSTALLATION

A. Provide all masonry construction aligned, plumb and true in required layout, making straight level courses. Construct masonry to full thickness as shown with masonry units of sizes as noted and specified, using whole units wherever possible. Cut masonry neatly by power-saw to obtain sharp edges without damage. Build-in items furnished by other trades, and leave accurate openings necessary for subsequent installation of other Work. Fill solidly around conduit passing through masonry with mortar.

B. Hollow units shall be laid with full mortar coverage on horizontal and vertical face shells. Webs shall also be bedded in all courses of piers, columns, pilasters, adjacent to any cores to be grouted, and in the starting course on footings and solid foundation walls. Solid units shall be laid with full head and bed joints.

C. Head and bed joints shall be 3/8 in. thick. Joints shall be tooled when thumbprint hard with a round tool. Joints on unexposed interior surfaces shall be cut flush.

D. Coordinate the installation of flashing materials.

E. Placement of Joint Reinforcing

1. Provide reinforcement in horizontal joints 16 in. on center vertically. Place units to provide continuous reinforcement, with corner and “tee” sections at all wall intersections; splice units together by lapping side bars a minimum of 6 in. at adjoining ends of lengths. Stop reinforcement 2 in. away from both sides of vertical control and expansion joints. At all openings in walls, place additional reinforcement in bed joint of courses above and below openings and extend at least 2 ft beyond each side of openings.

3.03 VERTICAL REINFORCING

A. Set steel reinforcing bars into epoxy in existing concrete following manufacturer's recommended procedure. Bars shall be of sizes and at spacings shown on Drawings.

B. No epoxy materials may be used at ambient temperature of less than 50°F.

C. Epoxies may be applied only to dry surfaces meeting manufacturer's recommendations for surface preparation and working temperatures. All surfaces must be free of moisture, dirt, organic materials, efflorescent salts and other contaminants. Ensure that all back-up conditions are dry and stable so that no salt deposit on the surface is expected.

D. Concrete masonry units shall be threaded over reinforcing steel. Cores containing reinforcing steel shall be completely free of mortar droppings.

E. Pour grout into cores containing reinforcing. Agitate grout to insure complete filling at grout spaces. Grout lifts shall be as allowed by referenced provisions. Stop grout 1 1/2 in. from top of masonry to form key with succeeding grout pour.

F. Provide vertical reinforcing at spacings and locations shown on Drawings. Additionally, provide reinforcing at all terminations, in cores on each side of expansion/control joints or any other disruptions, and at corners.

3.04 CONTROL JOINTS

A. Provide control joints in concrete masonry walls as shown on Drawings, 20 ft on center maximum.

3.05 CLEAN UP

A. All holes in joints of masonry surfaces to be exposed, or painted, shall be filled with mortar and suitably tooled. Concrete unit masonry walls shall be left clean and free from mortar spots and droppings. Any cracks in masonry shall be repaired. Defective joints shall be cut out and repointed.

B. At the conclusion of masonry work, remove all scaffolding and equipment used, in the Work, clean up all debris and refuse and surplus material and remove from premises.

END OF SECTION

SECTION 04 45 50

BRICK AND STONE MASONRY REPOINTING (TUCKPOINTING)

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section specifies requirements for tuck pointing of existing masonry and stone work.

1.02 RELATED WORK

B. Mortars: Section 04 10 00, Mortar.

1.03 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

1. C67-07 ..... Brick and Structural Clay Tile, Sampling and Testing

2. C216-07 ..... Facing Brick (Solid Masonry Units Made From Clay or Shale)

3. C270-07 ..... Mortar for Unit Masonry

C. International Masonry Institute: Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

PART 2 - PRODUCTS

2.01 TUCK POINTING MORTAR

A. As per appendix X3 of ASTM C270.

2.02 REPLACEMENT MASONRY UNITS

A. Face Brick:

1. ASTM C216, Grade SW, Type FBS. Brick shall be classified slightly efflorescent or better when tested in accordance with ASTM C67.

2. Face brick shall match facing brick of the existing building(s) that is being tuck pointed.

B. Other Units to match existing.

PART 3 - EXECUTION

3.01 CUT OUT OF EXISTING MORTAR JOINTS

A. Cut out existing mortar joints (both bed and head joints) and remove by means of a toothing chisel or a special pointer's grinder, to a uniform depth of to 19 mm (3/4-inch), or until sound mortar is reached. Take care to not damage edges of existing masonry units to remain.

B. Remove dust and debris from the joints by brushing, blowing with air or rinsing with water. Do not rinse when temperature is below freezing.

3.02 JOB CONDITIONS

A. Protection: Protect newly pointed joints from rain, until pointed joints are sufficiently hard enough to prevent damage.

B. Cold Weather Protection:

1. Tuck pointing may be performed in freezing weather when methods of protection are utilized.

2. Comply with applicable sections of "Recommended Practices for Cold Weather Construction" as published by International Masonry Industry All Weather Council.

3. Existing surfaces at temperatures to prevent mortar from freezing or causing other damage to mortar.

3.03 INSTALLATION OF TUCK POINTING MORTAR

A. Immediately prior to application of mortar, dampen joints to be tuck pointed. Prior to application of pointing mortar, allow masonry units to absorb surface water.

B. Tightly pack mortar into joints in thin layers, approximately 6 mm (1/4-inch) thick maximum.

C. Allow layer to become "thumbprint hard" before applying next layer.

D. Pack final layer flush with surfaces of masonry units. When mortar becomes "thumbprint hard", tool joints.

3.04 TOOLING OF JOINTS

A. Tool joints with a jointing tool to produce a smooth, compacted, concaved joint.

B. Tool joints in patch work with a jointing tool to match the existing surrounding joints.

3.05 REPLACEMENT OF MASONRY UNITS

A. Cut out mortar joints surrounding masonry units that are to be removed and replaced.

1. Units removed may be broken and removed, providing surrounding units to remain are not damaged.

2. Once the units are removed, carefully chisel out the old mortar and remove dust and debris.

3. If units are located in exterior wythe of a cavity or veneer wall, exercise care to prevent debris falling into cavity.

B. Dampen surfaces of the surrounding units before new units are placed.

1. Allow existing masonry to absorb surface moisture prior to starting installation of the new replacement units.

2. Butter contact surfaces of existing masonry and new replacement masonry units with mortar.

3. Center replacement masonry units in opening and press into position.

4. Remove excess mortar with a trowel.

5. Point around replacement masonry units to ensure full head and bed joints.

6. When mortar becomes "thumbprint hard", tool joints.

3.06 CLEANING

A. Clean exposed masonry surfaces on completion.

B. Remove mortar droppings and other foreign substances from wall surfaces.

C. First wet surfaces with clean water then wash down with a solution of soapless detergent specially prepared for cleaning brick.

D. Brush with stiff fiber brushes while washing, and immediately thereafter hose down with clean water.

E. Free clean surfaces from traces of detergent, foreign streaks or stains. Protect materials during cleaning operations including adjoining construction.

F. Use of muriatic acid for cleaning is **prohibited**.

END OF SECTION

SECTION 04 72 00

CAST STONE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Furnish all labor, materials, tools and equipment and perform all work necessary for and incidental to the installation of cast stone masonry and related work as shown on the drawings and specified herein: in accordance with the provisions of the Contract Requirements and completely coordinated with the work of all other trades.

B. Work of this Section shall include:

1. Laying out the work.
2. Constructing mockups.
3. Fabricating stone to proper shape, size, detail and finish to incorporate in the work.
4. Verifying the related wall-construction work is properly installed.
5. Laying up the stonework as shown and coordinated with other trades.
6. Pointing joints.
7. Cleanup.

C. Related Work Specified Elsewhere

1. Section 02 41 10 - Selective Demolition
2. Section 04 10 00 - Mortar
3. Section 07 60 00 - Flashing and Sheet Metal
4. Section 07 92 00 - Sealants and Caulking

1.02 REFERENCES

A. Applicable portions of the following standards shall apply

1. ACI - 318 - Building Code Requirements for Reinforced Concrete.
2. ASTM A 185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

3. ASTM A 615/A 615M - Standard specification for Deformed and Plain Billet -Steel Bars for Concrete Reinforcement.

4. ASTM C 33 - Standard Specification for Concrete Aggregate

5. ASTM C 150 - Standard Specification for Portland Cement

6. ASTM C 494 - Standard Specification for Chemical Admixtures for Concrete

7. ASTM C 642 - Standard Test Method for Specific Gravity, Absorption and Voids in Hardened Concrete.

8. ASTM - C979 - Standard Specifications for Pigments for Integrally Colored Concrete.

9. ASTM - C 1194 - Standard Test Method for Compressive Strength of Architectural Cast Stone

10. ASTM C 642 - Standard Test Method for Absorption of Architectural Cast Stone

11. ASTM C 1364 - Architectural Cast Stone

12. ASTM D 2244 - Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

13. Cast Stone Institute Technical Manual.

1.03 SUBMITTALS

A. Shop Drawings - Submit sealed shop drawings of fabrication and installation of cast stone, including but not limited to the following:

1. Dimensions, details, and reinforcing of each cast stone unit.

2. Bedding and jointing of units, including typical and special anchoring, joint details, flashing, weep holes and interface and connections to adjoining walls and materials, details of anchor pieces and inserts.

3. Setting-number of each stone and its location on the structure in annotated plans and elevations. Each stone when delivered is to bear the same number on an unexposed surface.

4. Shop drawings shall be sealed by a structural engineer licensed in the State of Illinois.

B. Working Drawings - Submit annotated contract drawings or new shop drawings at a scale of necessity to clearly indicate the exact extent of unit-priced work.

C. Product Data - Submit product data including annotated manufacturer's literature for each product proposed for use in the work, showing compliance with the specified requirements. Include test results and instructions for handling, storage and application of each material.

1. Submit details of each type of anchor and its use

2. Include test reports and certifications substantiating that products comply with specified requirements.

D. Samples - Submit 3 of each item for each set as required. Material delivered or erected which does not match approved samples is unacceptable.

1. Cast stone color/finish shall match existing

2. Preliminary Selection Samples - Manufacturer's standard color and finish samples, 3-inch by 5-inch by ½ inch, in the range corresponding to the colors specified or shown. It is expected that the required color will not exactly match these samples, but the mix for these may be used as a basis to modify and produce required special color-matched cast stone.

3. Special Color-Matched Samples - After receiving direction from the review of Preliminary Selection Samples, submit samples for specially mixed ingredients to the precise proportions that produce the exact color and exact finish of cast stone required, 3-inch by 5-inch, in the range corresponding to the colors and finishes specified or shown.

4. Product samples - After approval of the Special Color-Matched Samples, submit a sample of each general type of cast stone shape to be used in the work, showing color, texture, finish and quality of detailing. Each sample to measure at least 12-inches long by full cross section, with accurate detail representative of this project.

5. Accessories - Submit 3 of each type of anchor, accessory, and miscellaneous support.

E. Quality Assurance Submittals

1. Qualification data - submit for cast stone manufacturer to demonstrate their capabilities and experience. Include lists of completed projects (3 minimum) with project names and addresses, names and addresses of architects and owners, and other information required.

2. Draft of warranty - Before beginning the work, submit draft of special project warranty specified below sufficiently in advance so that the text can be reviewed, commented upon, and corrected before the work is begun. Do not use products unless draft of the required warranty is accepted.

3. Certification - Laboratory test report of cast stone, certified by cast stone manufacturer to be same quality as the samples submitted and the same as the products to be provided.

1.04 QUALITY ASSURANCE

A. Coordination

1. Coordinate the work of other trades involved with construction of cast-stone finished walls to ensure proper sequencing and construction.

2. Coordinate flashings for proper functioning of components.

B. Contractor's Knowledge of Work

1. On-site orientation

a. Before work may begin and proceed, ensure that each supervisor and mason who will perform the work is thoroughly familiar with the specific conditions relating to the building under construction, with the particular characteristics of cast stone masonry, and with the requirements of this section.

C. Cast Stone Manufacturer's Qualifications - Obtain cast stone from a single manufacturer with the following qualifications:

1. A cast stone manufacturer with experience, facilities and capacity to furnish custom cast stone work of the quality, sizes and quantity of cast stone required without delaying progress of the work.

2. Manufacturer's products are to have been previously used and exposed to weather for 5 years in similarly sized projects with satisfactory results.

D. Stone-Masonry Installer - Engage an experienced stone-masonry installation firm who has completed work in scope and size to that indicated for this Project, with more than 5 years of successful in-service performance. Have the stone masonry installer maintain a steady work crew consisting of qualified masons who fully understand the requirements of the job.

1. By way of qualification, have the stone-masonry installer present a minimum of 5 or more completed projects, as the Licensed Engineer may require, that demonstrate the firm's qualifications to perform this work to the Licensed Engineer's satisfaction.

2. Masons - Use only experienced stone masons for the work.

3. Knowledge of Contract Documents - Ensure that workers and supervisory personnel are familiar with and have ready access at the site to up-to-date drawings and specifications pertaining to this work.

E. Change of Firm or Personnel - Only the approved stone masonry installer and supervisors may work on the project. Fourteen calendar days before making any change of firm or staff, such change, including statement of qualifications as required above under Quality Assurance Submittals, must be submitted for approval. Failure to comply with this provision will, at the Licensed Engineer's discretion, be sufficient cause to reject the work.

F. Preconstruction Testing Program - Employ an independent testing laboratory, acceptable to the Owner, to perform preconstruction testing on samples of cast stone made from each type (mix and aggregate) of cast stone that has been approved for appearance.

1. Have laboratory use the test procedures as cited below under Properties of Cast Stone, testing at least 3 samples for each test, but not less than the number required or recommended by the cited tests (sets of samples).

2. Have cast stone manufacturer furnish to the testing laboratory sets of production quality samples that are textured, tooled and otherwise finished as required for installation.

3. Perform this testing program at least 2 months before beginning production of cast stone for installation.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the Project site undamaged, in manufacturer's original and unopened containers, labeled with manufacture date, type, and name of product and manufacturer. Handle materials in accordance with manufacturer's instructions.

B. Cast Stone

1. Pack cast stone so as to prevent damage in transit, and deliver in accordance with Contract schedule and setting sequence.

2. Deliver each piece of cast stone with setting number marked on unexposed face, corresponding to shop drawings, using non-staining paint. Deliver and unload cast stone. Prevent damage and soiling during delivery and unloading of cast stone.

3. Protect from disfiguring elements.

4. Separate cast stone from wood skids with polyethylene, or other non-staining material. Store clear of the ground under waterproof covering, and keep dry.

5. Remove unacceptable stones from job site immediately.

C. Store cementitious materials off the ground, under cover, and in a dry location.

D. Store aggregates, segregated, covered, and in a dry location, where grading and other required characteristics can be maintained and contamination prevented.

E. Comply with manufacturer's written instructions for minimum and maximum temperature requirements for storage.

1.06 PROJECT CONDITIONS

A. Environmental Conditions - Schedule and perform the work only under the following conditions or when these conditions are achieved artificially.

1. Weather

   a. Do not set, point, or repair masonry unless air temperature is between 40 degrees F and 80- degrees F, and will remain so for at least 48 hours after completion of work.
   b. Do not set or point masonry which is wet or frozen.
   c. Remove ice and frost formed on work to be pointed by carefully applying heat until surfaces are dry to the touch.
   d. Do not apply mortar to substrates with temperatures of 90 degrees F and above.
   e. Remove pointing and repairs damaged by rain, freezing and other conditions.

2. Protection of completed work

   a. When the mean daily air temperature is between 40 degrees F and 25 degrees F, protect completed masonry work and pointing by covering with weather resistive membrane for 24 hours after installation.
   b. When the mean daily air temperature is below 24 degrees F, protect completed masonry work and pointing by covering with insulating blankets or enclosing and heating as required to maintain work at a temperature above 32 degrees F for 24 hours after installation.
   c. Hot-Weather Requirements - Protect restoration work when temperature and humidity conditions produce excessive evaporation of water from mortar and patching materials. Provide artificial shade and wind breaks and use cooling methods as required.

3. Protection

   a. Prevent grout or mortar used in the work form staining face of surrounding masonry and other surfaces. Immediately remove grout and mortar in contact with exposed masonry and other surfaces.
   b. Protect other surfaces including but not limited to landscaping, woodwork, gutters and downspouts, sills, ledges and projections from droppings during performance of the work.

PART 2 - PRODUCTS

2.01 GENERAL

A. Single-Source Responsibility for Materials - Obtain each type of masonry material (cement, sand, etc.) from a single source to ensure a uniform match of quality, color, texture and variation throughout the project.

2.02 CAST STONE MATERIALS

A. Cement - Portland cement, ASTM C150, Type I white or gray, as necessary for appearance.

B. Fine Aggregate - ASTM C33, composed of graded and washed natural sands, or crushed and ground granite, marble, quartz or limestone sands, except that size gradation may vary to achieve desired finish and texture as approved.

C. Coarse Aggregate - ASTM C33, composed of graded and washed natural gravel, or crushed graded granite, marble quartz, or limestone, except that the size gradation may vary to achieve desired finish and texture as approved.

D. Pigment - ASTM C979 -inorganic iron oxide pigments, free of carbon black, guaranteed by manufacturer to be fade proof, and unaffected by alkali. Amount of pigment not to exceed 10 percent by weight of the cement used.

E. Admixtures - ASTM C494 and ASTM C260.

F. Water - Clean, potable and free of deleterious materials.

G. Reinforcing Steel - Use either stainless steel, Type 302 or 304, or galvanized steel as follows for fully-embedded steel:

1. Bars - ASTM A615, deformed, grade 40 or 60, galvanized. Size reinforcing as shown on approved shop drawings.
2. Wire and welded wire fabric - ASTM A82 and ASTM A185, galvanized.
3. Galvanize by the hot-dip process per ASTM A123.
4. Touch up cut ends with zinc rich paint.

H. Embedded and Semi-embedded Anchoring Devices, Dowels, Inserts, Loops and Accessories. Standard building stone anchors of stainless steel Type 302 or 304.

2.03 CAST STONE MASONRY UNITS

A. General

1. Comply with ASTM C1364, Standard Specifications for Architectural Cast Stone, except as otherwise required in these Specifications.

2. Comply with the recommended practices of PCI MNL-117, Manual for Quality Control of Plants and Production of Architectural Precast Products; with the ACI Manual of Concrete Inspection, and with the standards of the Cast Stone Institute.

3. Fabricate cast stone form mortar materials as specified below, high range water reducer, microsilica and large aggregate having the properties and finishes as specified.

A. Measurements - Take on site dimensions to ensure proper installation of the work. Fabricate units based upon design dimensions as indicated and upon verified on-site dimensions to ensure proper installation of the work.

B. Casting Process - Vibrant Dry Tamp (VDT) method, consisting of vibratory ramming of damp, zero-slump concrete (stiff or very dry consistency) against a rigid form until it densely compacted and ready for immediate removal from the form, followed by damp curing in a temperature and humidity controlled chamber.

C. Properties

1. Compressive strength, wet and dry, ASTM C1194; Minimum 7,000 psi at 28 days.

2. Water absorption, 48 hour cold water absorption and 5-hour boil absorption, ASTM C1195: Maximum 5-percent.

3. Air entrainment, ASTM C185; 5 to 7 percent

D. Color and Finish

1. Color - Special color, matching existing cast stone on campus as directed.

2. Finish - Fine-grained texture matching existing cast stone on campus as directed, similar to natural limestone; based upon an appearance evaluation by the Licensed Engineer made from 15 feet away.

3. No bug holes are acceptable.

4. Range of acceptable color and aggregate size: Within the range of special color matched samples as approved. This range may contain natural appearing variations similar to variations in natural Indiana limestone. No blotchy or linear discolorations are acceptable.

E. Detailing

1. Fabricate units in sizes and with joint patterns matching existing and as shown on Contract Drawings and approved shop drawings.

2. Provide 3/8 inch joints, unless otherwise shown.

3. Thickness - Minimum 3 ½ inches at any point, except as otherwise required.

4. Reinforcement -

    a. Quantity - Zero reinforcement, except for structural purposes in members supporting bending and shear loads, such as lintels or suspended units, in which case use reinforcing designed for such loads. Do not use reinforcement for handling purposes. Handle units with the same care as if handling natural cut stone.
    b. Coverage of reinforcing: Minimum 1-inch cast stone coverage over the reinforcing steel and not less than twice the diameter of the largest reinforcing bar.
    c. Galvanizing touch up - Touch up cut ends of galvanized reinforcing with galvanizing repair paint in 2 coats before placing reinforcement in forms.
    d. Anchorage to backup construction - Provide a minimum anchorage as follows, and in accordance with standard practice: Not less than 1 anchor for every 6 square feet of stone Minimum of 2 anchors at each head and bed joint.

F. Stone Dimension Tolerance-Maximum overall error either plus or minus 1/8 inch or length /360, whichever is greater.

G. Curing - As a minimum, cure in a totally enclosed curing room under dense fog and water spray at 95 percent relative humidity for a period of 24 hours or longer.

H. Testing - Tests are to be made at the Contractor's expense by an independent testing laboratory acceptable to the Owner.

I. Sources - Subject to specified requirements, provide Cast Stone by one of the following:

1. Architectural Art Stone, Kansas City, KS; 913.321.9100.

2. Continental Cast Stone, Shawnee, KS; 913.422.7575.

3. W.N. Russell and Company, Westmont, NJ; 609.858.1057.

2.04 MORTAR MATERIALS

A. See Section 04 10 00 - Mortar

2.05 ACCESSORIES

A. Anchorages - Provide anchors, cramps, pins, etc. for securing stone masonry, of type and size shown or, if not shown, as required to properly secure stone and to execute the work in accordance with cast stone manufacturer's approved shop drawings. Fabricated anchorages from AISI Type 302 or 304 stainless steel, configured to turn into stone a minimum of ½ inch and of the following minimum cross sections, except as otherwise indicated or shown on approved shop drawings:

1. One way anchor bars and cramps: Minimum 1/8 inch x 1-inch bar,
2. Two-way anchor bars: Minimum 1/8 inch x 2-inch bar,
3. Pins and dowels: 3/8 inch diameter threaded rods.
4. Anchor bars with dowels: 3/16 inch by 1-inch bar.
5. Anchors to concrete: Tamp in anchors with 3,000 pound hold fast strength or anchors suitable for use with dovestail slots.
6. Lewis anchors for lifting stones: ¾ inch diameter.

B. Sealant Materials -See Section 07 92 00 Sealants and Caulking

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with manufacturer's written instructions for products.

B. Build work to dimensions and profiles indicated. Rebuild areas when unsound units have been removed. Build chases and recesses shown or required for the work of other trades. Build in anchors as required for attaching other work.

3.02 PREPARATION

A. Inspection

1. Together with the stone-masonry installer, examine the substrate and the conditions under which the work is to be performed and notify the Licensed Engineer in writing of any conditions detrimental to the proper and timely completion of the work.
2. Do not proceed with the work until the unsatisfactory conditions have been corrected in a manner acceptable to the stone masonry installer and the Licensed Engineer.

B. Measurements - Prior to installation of the units, verify on site the dimensions affecting proper installation of the work.

1. Bring to the Licensed Engineer's attention, any discrepancies between design dimensions and field dimensions which would adversely affect proper installation as required.

2. Do not proceed with the installation until dimensional discrepancies are corrected and accepted by the Licensed Engineer.

C. Protection

1. Provide and maintain effective, non-staining protection for adjacent surfaces and areas below the work during performance of the work. Protect surfaces from damage and from contact with droppings from the work.

D. Preparation - Prior to setting, clean stone surfaces that have become dirty or stained to remove soil, stains, stone dust and foreign material. Clean stones by thoroughly scrubbing stones with fiber brushes followed by a thorough drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh filler or abrasives.

3.03 GENERAL INSTALLATION OF CAST STONE AND TOLERANCES

A. Layout

1. Lay out the work in advance of setting in wall so as to ensure accurate spacing of units with uniform joint widths and for accurate locating of openings, movement type joints, returns and offsets.

B. Cutting and Shaping - Do not cut or shape cast stone. If a unit is improperly cast, have it factory recast. For very special conditions the Licensed Engineer may permit cutting if the cut end is fully concealed or embedded.

C. Reject stones with the following defects:

1. Cracked stones

2. Stones with chips greater than 1/8 inch deep by ½ inch long.

3. Patched stones, except as accepted by the Licensed Engineer.

D. Lay-up

1. When setting with mortar, drench stones with clear water just prior to setting. Protect surfaces from splashing mortar or damage by other trades. Remove foreign matter splashed on stone immediately.

2. In Preparation for pointing, rake out setting mortar ¾ inch deep before mortar sets.

3. Install anchors, cramps, pins and other attachments required to properly secure stonework in place. Place anchors, dowels and other fasteners in holes, and pack holes with mortar.

4. Lay walls to comply with specified construction tolerances, coordinated with other construction, running edges aligned, and joints uniform.

E. Stopping and Resuming the Work - Clean exposed surfaces of set masonry units and mortar prior to laying fresh masonry.

F. Tolerances - Except as required to properly align with existing construction, keep to the following tolerances:

1. Variation from Plumb: for vertical lines and surfaces of columns, walls and arises, do not exceed 1/8 inch in 10 feet, or ¼ inch in 20 feet, nor 3/8 inch maximum. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed ¼ inch to 20 feet, nor ½ inch to 40 feet or more. For vertical alignment of head joints, do not exceed plus or minus ¼ inch in 10 feet, nor ½ inch maximum.

2. Variation from Level: For bed joints and liens of exposed lintels, sills, parapets cornices, horizontal grooves, and other conspicuous lines, do not exceed 1/8 inch in 20 feet, nor ¼ inch in 40 feet or more.

3. Variation from plane: Set stones within a tolerance of plus or minus 1/16 inch out-of-plane from adjacent units.

4. Variation of mortar joint thickness: Maximum plus or minus ¼ of typical joint width. Zero variation between adjacent aligning joints.

3.04 POINTING

A. General

1. Follow manufacturer's instructions regarding the proper preparation and use of tools and materials.

2. Perform pointing using methods and materials for accepted mockups.

3. Verify that joints have been raked out prior to pointing. Do not rake out during pointing.

4. Brush, vacuum, or flush joints with compressed air as necessary to remove dirt and loose debris.

B. Pointing with Mortar

1. Take care not to spread mortar onto exposed stone surfaces or to featheredge the mortar over rounded or chipped edges of units.

2. Curing - Keep mortar damp until cured, not less than 7 days.

3. Hairline cracking within the joint or separation at the edge of the joint is unacceptable. Completely remove such joints and reinstall.

4. Remove all traces of surplus mortar as the work progresses.

C. Pointing with Sealant - Install sealant in projecting head joints in lieu of pointing mortar where indicated. See Section 07 92 00.

3.05 PATCHING

A. Perform repair of chipped or damaged cast stone only where specifically approved by Licensed Engineer.

B. Patching and repairing of chipped, spalled, cracked, or otherwise imperfect pieces may not exceed ½ to 1 percent of face area.

C. Perform repairs only with mechanics skilled in this class of work, with materials furnished by the manufacturer and according to the manufacturer's directions. Determine patching material and mix by making at least 6 cured, dried samples until an approved match is obtained.

D. Cast stone repair is acceptable only if it shows no evidence of repair or imperfections when viewed with unaided eye under good typical lighting at a 15 foot distance, as determined by the Licensed Engineer.

3.06 FIELD CUTTING CAST STONE

A. General - Do not field cut cast stone. However, where a cut end would be fully concealed or embedded, a specific exception may be approved by the Licensed Engineer. In such case, perform field cutting as follows:

B. Use high speed cutting equipment, grinders and appropriate masonry files to cut and smooth edges of units as necessary, subject to the Licensed Engineer's acceptance of methods and results.

C. Where field-cut units have exposed the ends of reinforcing, prepare those ends as follows:

1. Grind back end of reinforcing to a point recessed at least ½ inch into the surface of the unit.

2. Touch up end of reinforcing in recess with galvanizing repair paint in 2 coats, being careful not to get paint on sides of recess. This is not required for stainless steel reinforcing.

3. Apply bonding agent and pack recess tightly with setting mortar. Damp cure the patch, then test patch by tapping with a hammer before setting unit in wall. Replace loose patches.

3.07 CLEANUP

A. Upon completion of the work, remove all scaffolding and equipment used in the work, clean up all debris, refuse and surplus material and remove same from site

END OF SECTION

DIVISION 5 – METALS

SECTION 05 10 00

STEEL ANGLES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Furnish all labor, materials, tools and equipment and perform all work necessary for and incidental to providing structural steel as shown on the Drawings and specified herein; in accordance with the provisions of the Contract Requirements - Division 0, General Requirements - Division 1 and completely coordinated with the Work of all other trades.

B. Work of this section shall include:

1. All steel normally falling under definition of structural steel as set forth in latest edition of AISC Code of Standard Practice, Section 2
2. All steel installed in the Work relating to the installation of the new steel angles that are to support the exterior masonry walls.
3. All steel items reasonably implied but not specifically mentioned on Drawings or specified herein to render Work secure and complete. This includes all connections and erection accessories.

C. Related Work specified elsewhere:

1. Section 01 53 23 - Submittals (Shop Drawings, Product Data, and Samples)
2. Section 02 41 10 - Selective Demolition
3. Section 04 10 00 - Mortar
4. Section 04 20 00 - Brick Masonry
5. Section 07 60 00 - Flashing and Sheet Metal
6. Section 07 92 00 - Sealants and Caulking

1.02 QUALITY ASSURANCE

A. Qualifications:
1. Contractor: Shall have a minimum of five (5) years of experience in the erection and connection of structural steel elements.
2. Fabricator shall have a minimum of ten (10) years of experience in the fabrication of structural steel elements.

B. Reference Standards
1. AISC - "Code of Standard Practice for Steel Buildings and Bridges"
2. AISC - "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" and including the "Commentary" and issued supplements

3. AISC - "Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts"
4. SSPC (Structural Steel Painting Council) - "Specifications for General Surface Preparation of Structural Steel SPC-SP-5"
5. AWS - "Structural Welding Guide"
6. SJI - "Recommended Code of Standard Practice for Steel Joists and Joist Girders"
7. ASTM A 6 - "General Requirements for Delivery of Rolled Steel Plates, Shapes and Bars for Structural Use
8. Welders, welding operations and procedures shall be certified for the type of welding being done in accordance with the ASW/AISC Society. Such certification shall be dated within twelve (12) months of the performance of the Work.

C. Control
1. Construction shall be in accordance with all applicable federal, state and local laws and ordinances
2. Adequate control shall be taken to minimize the dust and other pollution created by the work and its spread
3. The Contractor shall be fully responsible for any and all injuries and property damage caused by his work.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 53 23:

1. Manufacturer's Literature: Description of shop primer
2. Manufacturer's Data; Certified Mill Reports
3. Shop Drawings: Complete fabrication and erection details and schedules.
   a. Shop Drawings shall have been thoroughly checked by fabricator before being submitted for review. Review is precautionary measure only and shall not relieve fabricator or contractor of full responsibility of correctness of all materials, sizes, dimensions and details.
   b. In case structural sections or details indicated on Drawings cannot be readily obtained, substitution of sections or details or equal strength which conform to requirements of design may be made only if approved
   c. Fabrication shall not proceed until Shop Drawings have been reviewed. Fabrication, assembly and erection shall conform to reviewed Shop Drawings.

1.04 PRODUCT DELIVER, HANDLING AND STORAGE

A. Deliver and handle materials in such a manner as to prevent damage. Store structural steel and accessories above ground on wood blocking and protect from damage until installed. All damaged or otherwise unsuitable material shall be removed from the job site.

B. Schedule delivery of items required by other trades so as not to delay their work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Structural Steel Shapes and Plates: ASTM A 36.
   1. All members to be hot dipped galvanized unless otherwise noted.

B. Threaded Steel Fasteners: ASTM A 325.

C. Welding Electrodes: Welding electrodes shall be E70XX (AWS D1.1-80).

D. Expansion Anchors:

   1. Stud type and stainless steel expansion anchors in accordance with ASTM B633, SCI, Type III and meet the requirements of Federal Specification FF-S-325, Group II, Type 4, Class 1. Anchors shall be countersunk "Hilti-Kwik Bolt II" manufactured by Hilti Fastening Systems, or approved equal. Sizes and embedment length are as shown on the Drawings.

E. Self-Tapping Screws: Hilti Dril-It, ¼ - 20. Length is to be appropriate for usage.

F. Galvanizing Touch-up Paint: Tnemec 90-97

2.02 FABRICATION

A. Material shall be properly marked and match-marked where field assembly so requires. The sequence of shipments shall be such as to expedite and minimize the field handling of material.
B. Dimensions shown on Drawings are approximate. Take field measurements to verify and supplement dimensions shown on Drawings.
C. Weld in accordance with the recommendations of the AWS D1.1 latest edition.
D. Grind all new steel edges smooth.

2.03 GALVANIZED COATING

A. All structural steel shall be hot dipped galvanized (1.5 oz/sq ft) in accordance with ASTM A123.

PART 3 - EXECUTION

3.01 ERECTION

A. Material stored at the job site shall not exceed design loads on structures so that members will not be distorted or otherwise damaged; and shall be protected against corrosion or deterioration.

B. Burning shall not be used to form holes, enlarging of holes or matching or unfair holes. No member shall be altered in field unless approved by Owner’s Representative.

C. Remove paint, primer, etc., to bare metal on new and existing surfaces to be welded.

D. Temporary bracing throughout all phases of erection and construction shall be introduced wherever necessary to take care of all loads to which structure may be subjected including equipment and

operation of same. Wherever piles of material, erection equipment or other loads are carried during erection, proper provisions shall be made to safely support these abnormal loads.

E. All members shall be cut neat and square and should be erected true and flush without twists and open joints. Light drifting to draw holes together may be used.

F. All steel exposed to view shall be free of surface imperfections and ground off to true surfaces.

G. Touch up paint on steel members in field after complete installation.

3.02 INSPECTIONS AND TESTS

A. Contractor or testing laboratory hired by Contractor will make inspections and perform tests in accordance with the following: Where tests are the responsibility of the Owner it is so indicated.

1. Obtain and furnish mill reports for steel.
2. Verify that certification of welders is not more than one year prior to time welding work is to be performed.
3. Visually inspect all welds. Conform to the latest edition of American Welding Society Specifications.
4. Perform radiographic magnetic particle and ultrasonic inspections of welds (Owner's option and cost)
5. Test shop bolted connections by loosening and retightening two bolts per high strength bolted connection. Tension after nuts are retorqued shall be at least equal to that shown or as required by ASTM A 325 (Owner's option and cost).
6. Test field bolted connections by checking at least two bolts of every second high strength bolted connection with a calibrated torque wrench for tension at least 5 percent higher than that shown or as required by ASTM A 325 by the method as outlined in the "Specifications for Assembly of Structural Joints Using High Strength Steel Bolts" (Owner's option and cost).

B. If tests performed at the cost of the Owner reveal inadequate construction, the Contractor shall repair the construction **and** reimburse the Owner for testing costs.

C. The Owner’s Representative reserves right to perform at random nondestructive pull-out tests of expansion anchors installed in a concrete column and concrete slabs.

D. The Contractor shall cooperate with Owner’s Representative's personnel providing access to the testing area.

3.03 CLEANUP

A. At the conclusion of steel erection, remove all equipment used in the Work, clean up all debris, refuse and surplus material and remove same from premises.

END OF SECTION

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 07 01 50.19

PREPARATION FOR RE-ROOFING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Roof tear-off, temporary roofing membrane, removal of base flashings on existing construction in preparation to receive new roofing membrane.
B. Existing Membrane Roofing System: Modified bituminous roofing membrane, with related insulation, surfacing, and components and accessories between deck and roofing membrane.

1.02 RELATED WORK

A. Use of the premises and phasing requirements: Section 01 00 00 GENERAL REQUIREMENTS.
B. Temporary construction and environmental-protection measures for reroofing preparation: Section 01 00 00 GENERAL REQUIREMENTS
C. HVAC equipment removal and reinstallation: Division 23 sections.
D. Electrical equipment disconnection and reconnection: Division 26 sections.

1.03 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
B. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):
   1. ANSI/SPRI FX-1-01(R2006) Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
C. ASTM International (ASTM):
   1. C208-08 Cellulosic Fiber Insulating Board
   2. C728-05 Perlite Thermal Insulation Board
   3. C1177/C1177M-08 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
   4. C1278/C1278M-07 Standard Specification for Fiber-Reinforced Gypsum Panel
   5. D1079-09 Standard Terminology Relating to Roofing and Waterproofing
D. FM Approvals: RoofNav Approved Roofing Assemblies and Products.
   1. 4450-89 Approved Standard for Class 1 Insulated Steel Deck Roofs
   2. 4470-10 Approved Standard for Class 1 Roof Coverings
   3. 1-28-09 Loss Prevention Data Sheet: Design Wind Loads.
   4. 1-29-09 Loss Prevention Data Sheet: Above-Deck Roof Components
   5. 1-49-09 Loss Prevention Data Sheet: Perimeter Flashing

1.04 MATERIALS OWNERSHIP

A. Assume ownership of demolished materials and remove from Project site and dispose of legally, unless indicated to be reused, reinstalled, or otherwise to remain Owner's property.

1.05 DEFINITIONS

A. Refer to ASTM D1079 and NRCA "The NRCA Roofing and Waterproofing Manual" for definition of terms.

1.06 QUALITY CONTROLS

A. Requirements of Division 07 roofing section for qualifications of roofing system and roofing insulation Installer; work of this section shall be performed by same Installer.
   1. Where Project requirements include removal of asbestos-containing material, Installer must be legally qualified to perform the required work.
   2. Where Project requirements include work affecting existing roofing system to remain under warranty, Installer must be approved by warrantor of existing roofing system.

B. Regulatory Requirements: Comply with governing EPA notification regulations. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Reroofing Conference: Conduct conference at Project site.
   1. Meet with Owner; Architect-Engineer; testing and inspecting agency representative; roofing system manufacturer's representative; roofing Installer including project manager, superintendent, and foreman; and installers whose work interfaces with or affects reroofing.
   2. Review methods and procedures related to roofing system tear-off and replacement

1.07 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:
   1. Recover boards.

C. List of proposed infill materials.

D. List of proposed temporary roofing materials.

E. Fastener pull-out test report.

F. Photographs or Videotape: Document existing conditions of adjacent construction including site improvements.

G. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a licensed landfill facility.

H. Qualification Data: For Installer.
   1. Certificate indicating Installer is licensed to perform asbestos abatement.
   2. Certificate indicating Installer is approved by warrantor of existing roofing system.

1.08 PROJECT CONDITIONS

A. Owner will occupy portions of building below reroofing area. Conduct reroofing so Owner's operations will not be disrupted.
   1. Coordinate work activities daily with Owner.
   2. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.
B. Protect building and landscaping from damage.
C. Maintain access to existing walkways and adjacent occupied facilities.
D. Available Information: The following are available for Contractor reference:
   1. Construction Drawings and Project Manual for existing roofing system.
   2. Contractor is responsible for interpretation and conclusions based upon available information.
E. Weather Limitations: Proceed with reroofing preparation only when weather conditions permit Work to proceed without water entering existing roofing system or building.
F. Hazardous Materials: It is not expected that Contractor will encounter hazardous materials such as asbestos-containing materials.
   1. Owner will remove hazardous materials before start of the Work.
   2. Do not disturb materials suspected of containing hazardous materials. Notify Architect-Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract.

1.09 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces affected by reroofing, by methods and with materials acceptable to warrantor.
   1. Notify warrantor of existing roofing system before proceeding, and upon completion of reroofing.
   2. Obtain documentation verifying that existing roofing system has been inspected by warrantor and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.01 AUXILIARY REROOFING MATERIALS

A. General: Auxiliary reroofing preparation materials recommended by roofing system manufacturer and compatible with components of existing and new membrane roofing system.
B. Base Sheet Fasteners: Capped head, factory-coated steel fasteners, listed in FM Approval's "RoofNav."
C. Metal Flashing Sheet: Metal flashing sheet is specified in Section 07 60 00 SHEET METAL FLASHING AND TRIM.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect existing membrane roofing system that is indicated not to be reroofed.
   1. Limit traffic and material storage to areas of existing roofing membrane that have been protected.

2. Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.

B. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.
   1. Comply with Owner's requirements for maintaining fire watch when temporarily disabling smoke detectors.

C. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

D. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
   1. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding.
   2. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

E. Verify that rooftop utilities and service piping have been shut off before beginning the Work.

3.02 ROOF TEAR OFF

A. General: Notify Owner each day of extent of roof tear-off proposed for that day and obtain authorization to proceed.

B. Roof Tear-Off: Remove existing roofing membrane and other membrane roofing system components down to the deck. Remove all cover boards, roof insulation, substrate boards, etc.
   1. Dry bitumen and felts that are firmly bonded to concrete decks may remain. Remove wet or unadhered bitumen and felts.
   2. Remove fasteners from deck.

3.03 DECK PREPARATION

A. Inspect deck after tear-off of membrane roofing system.

B. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263. Do not proceed with roofing work if moisture condenses under the plastic sheet.

C. If deck surface is not suitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect-Engineer. Do not proceed with installation until directed by Architect-Engineer.

3.04 EXISTING BASE FLASHINGS

A. Remove existing base flashings around parapets, curbs, walls, and penetrations.
   1. Clean substrates of contaminants such as asphalt, sheet materials, dirt, and debris.

B. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings specified in Section 07 60 00 SHEET METAL FLASHING AND TRIM.

C. Provide new pressure-preservative, exterior fire-retardant-treated plywood sheathing, thickness as indicated on drawings..

3.05 COVER BOARD INSTALLATION

A. Install cover boards over roof insulation with long joints in continuous straight lines and end joints staggered between rows. Loosely butt cover boards together and fasten to deck.
   1. Fasten cover boards to resist wind-uplift pressure at corners, perimeter, and field of roof specified in Section 07 52 16.13 SBS Modified Bituminous Membrane Roofing, Cold Applied.
   2. Install additional fasteners near board corners and edges as necessary to conform boards to substrate and to adjacent boards.

3.06 DISPOSAL

A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
   1. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 07 22 00

ROOF AND DECK INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Roof and deck insulation, vapor retarder and cover board on existing construction ready to receive roofing or waterproofing membrane.

1.02 RELATED WORK

A. General sustainable design documentation requirements: Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS.
B. Blocking and Sheathing: Section 06 10 00, ROUGH CARPENTRY.
C. Temporary roof / vapor retarder material: Section 07 52 16.13, STYRENE-BUTADIENE-STYRENE MODIFIED BITUMINOUS MEMBRANE ROOFING, COLD APPLIED.
D. Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.

1.03 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
B. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE):
   1. 90.1-07 Energy Standard for Buildings Except Low-Rise Residential Buildings
C. ASTM International (ASTM):
   1. C208-08 Cellulosic Fiber Insulating Board
   2. C552-07 Cellular Glass Thermal Insulation
   3. C726-05 Mineral Fiber Roof Insulation Board
   4. C728-05 Perlite Thermal Insulation Board
   5. C1177/C1177M-08 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
   6. C1278/C1278M-07 Standard Specification for Fiber-Reinforced Gypsum Panel
   7. C1289-10 Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
   8. C1396/C1396M-09 Standard Specification for Gypsum Board
   9. D41-05 Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
   10. D312-06 Asphalt Used in Roofing
   11. D1970-09 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
   12. D2178-04 Asphalt Glass Felt Used in Roofing and Waterproofing

13. D2822-05 Asphalt Roof Cement
14. D4586-07 Standard Specification for Asphalt Roof Cement, Asbestos-Free
15. E84-09 Standard Test Method for Surface Burning Characteristics of Building Material
16. F1667-05 Driven Fasteners: Nails, Spikes, and Staples

D. FM Approvals: RoofNav Approved Roofing Assemblies and Products.
1. 4450-89 Approved Standard for Class 1 Insulated Steel Deck Roofs
2. 4470-10 Approved Standard for Class 1 Roof Coverings
3. 1-28-09Loss Prevention Data Sheet: Design Wind Loads.
4. 1-29-09Loss Prevention Data Sheet: Above-Deck Roof Components
5. 1-49-09Loss Prevention Data Sheet: Perimeter Flashing

E. National Roofing Contractors Association: Roofing and Waterproofing Manual

F. U.S. Department of Agriculture (USDA): USDA BioPreferred Catalog, www.biopreferred.gov

G. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory (2009)

H. U.S. Department of Commerce National Institute of Standards and Technology (NIST):
1. DOC PS 1-09 U.S. Product Standard for Construction and Industrial Plywood
2. DOC PS 2-04 Performance Standard for Wood-Based Structural-Use Panels.

1.04 PERFORMANCE REQUIREMENTS

A. Thermal Performance: Provide roof insulation meeting minimum overall average R-value of 25, with minimum R-value at any location of 10.

B. FM Approvals: Provide roof insulation complying with requirements in FM Approvals 4450 and 4470 as part of specified roofing system, listed in FM Approvals "RoofNav" as part of roofing system meeting Fire/Windstorm Classification in Division 07 roofing section.

C. Certified Drainage: Contractor shall certify to the Owner that the new roof system designed meets a minimum ¼” per foot slope as indicated on the drawings.

1.05 QUALITY CONTROL

A. Requirements of Division 07 roofing section for qualifications of roofing system insulation Installer; Work of this Section shall be performed by same Installer.

B. Requirements of Division 07 roofing section for inspection of Work of this Section and qualifications of Inspector.

C. Unless specified otherwise, comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to insulation for storage, handling, and application.

D. Requirements of roofing system uplift pressure design for specified roofing system.

E. Requirements of applicable FM Approval for specified roofing system insulation attachment.

F. Requirements of applicable Miami-Dade County approval for high-wind zone design.

G. Bio-Based Materials: Where applicable, provide products designated by USDA and meeting or exceeding USDA recommendations for bio-based content, and products meeting Rapidly Renewable Materials and certified sustainable wood content definitions; refer to www.biopreferred.gov.

1.06 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Product Data:
   1. Asphalt and adhesive materials, each type.
   2. Roofing cement, each type.
   3. Roof insulation, each type.
   4. Cover board, each type.
   5. Fastening requirements.
   6. Insulation span data for flutes of metal decks.

C. Federal Sustainable Design Submittals:
   1. Product Data: For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
   2. Product Data: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
   3. Product Data for Federally-Mandated Bio-Based Materials: For roof materials, indicating USDA designation and compliance with definitions for bio-based products, Rapidly Renewable Materials, and certified sustainable wood content.

D. Shop Drawings: Include plans, sections, details, and attachments.
   1. Nailers, cants, and terminations.
   2. Layout of insulation showing slopes, tapers, penetration, and edge conditions.

E. Samples:
   1. Roof insulation, each type.
   2. Nails and fasteners, each type.

F. Certificates:
   1. Indicating type, thermal conductance, and minimum and average thickness of insulation.
   2. Indicating materials and method of application of insulation system meet the requirements of FM Approvals for specified roofing system.

G. Laboratory Test Reports: Thermal values of insulation products.

H. Layout of tapered roof system showing units required.

I. Documentation of supervisors' and inspectors' qualifications.

J. Material Safety Data Sheets (MSDS): For all materials specified within this section.

K. Certification that the new roof system designed meets a minimum ¼” per foot slope as indicated on the drawings.

1.07 DELIVERY, STORAGE ANS MARKING

A. Comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to built-up roofing for storage, handling and installation requirements.

1.08 QUALITY ASSURANCE

A. Roof insulation on combustible or steel decks shall have a flame spread rating not greater than 75 and a smoke developed rating not greater than 150, exclusive of covering, when tested in accordance with ASTM E84, or shall have successfully passed FM Approvals 4450.
   1. Insulation bearing the UL label and listed in the UL Building Materials Directory as meeting the flame spread and smoke developed ratings will be accepted in-lieu-of copies of test reports.
   2. Compliance with flame spread and smoke developed ratings will not be required when insulation has been tested as part of a roof construction assembly of the particular type used for this project and the construction is listed as fire-classified in the UL Building Materials Directory or listed as Class I roof deck construction in the FM Approvals "RoofNav."
   3. Insulation tested as part of a roof construction assembly shall bear UL or FM labels attesting to the ratings specified herein.

PART 2 - PRODUCTS

2.01 ADHESIVE MATERIALS

A. Adhesive Materials, General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.
   1. Liquid-type adhesive materials shall comply with VOC limits of authorities having jurisdiction.
   2. Adhesives and sealants shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Primer: 664 g/L.
      b. Temporary Roof / Vapor Retarder Adhesives: 205 g/L.
      c. Insulation Adhesives: 0 g/L.
      d. Cover Board Adhesives: 0 g/L.
      e. Nonmembrane Roof Sealants: 300 g/L.
B. Primer: ASTM D41.
C. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free, cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.
D. Bead-Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.
E. Full-Spread Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.
F. Roof Cement: Asbestos free, ASTM D2822, Type I or Type II, or D4586, Type I or Type II.

2.02 ROOF AND DECK INSULATION

A. Roof and Deck Insulation, General: Preformed roof insulation boards approved by roofing manufacturer and listed as component of FM Approvals-approved roofing system.
B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.

C. Tapered Roof Insulation System:
   1. Fabricate of polyisocyanurate board. Use only factory-tapered insulation.
   2. Cut to provide high and low points with crickets and slopes as shown.
   3. Minimum thickness of tapered sections; 38 mm (1-1/2 inch).
   4. Minimum slope 1:48 (1/4 inch per 12 inches).

2.03 INSULATION ACCESSORIES

A. Glass (Felt): ASTM D2178, Type VI, heavy duty ply sheet.
B. Cants and Tapered Edge Strips:
   1. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.
   2. Tapered Edge Strips: 1:12 (one inch per foot), from 0 mm (0 inches), 300 mm to 450 mm (12 inches to 18 inches) wide.
      a. Cellulosic Fiberboard: ASTM C208.
      b. Mineral Fiberboard: ASTM C726.
      c. Perlite Board: ASTM C728.
C. Vapor Retarder:
   1. Glass-Fiber Felts: ASTM D2178, Type IV, asphalt impregnated.
   2. Self-Adhering Sheet Vapor Retarder: ASTM D1970, minimum of 1.0-mm- (40-mil-) thick, polyethylene film laminated to layer of rubberized asphalt adhesive, or 0.76- to 1.0-mm- (30- to 40-mil-) thick, polyethylene film laminated to layer of butyl rubber adhesive; maximum permeance rating of 6 ng/Pa x s x sq. m (0.1 perm).
D. Cover Board:
   1. Glass-mat, water-resistant gypsum substrate, ASTM C1177/C1177M, thickness as indicated on drawings, factory primed.

2.04 FASTENERS

A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with FM Approvals 4470, designed for fastening substrate board to roof deck.
B. Staples and Nails: ASTM F1667. Type as designated for item anchored and for substrate.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Comply with requirements of Division 07 roofing section.

3.02 PREPARATION

A. Comply with requirements of Division 07 roofing section.

3.03 VAPOR RETAINER INSTALLATION

A. General:

1. Install continuous temporary roof / vapor retarder on roof decks where indicated. Temporary roof / vapor retarder materials are identified within Section 07 52 16.13.
2. At vertical surfaces, turn up vapor retarder to top of insulation or base flashing.
3. At all pipes, walls, and similar penetrations through vapor retarder, seal openings with roof cement to prevent moisture entry from below.
4. Seal penetrations with roof cement.

B. Cast in Place Concrete Decks, Except Insulating Concrete:
1. Prime deck as specified.
2. Apply two plies of asphalt saturated felt mopped down to deck.

3.04 RIGID INSULATION INSTALLATION

A. Insulation Installation, General:
1. Install roof insulation in accordance with roofing system manufacturer's written instructions.
2. Install roof insulation in accordance with requirements of FM Approval's Listing for specified roofing system.
3. Base Sheet: Where required by roofing system, install one lapped base sheet specified in Division 07 roofing section by mechanically fastening to roofing substrate prior to installation of insulation.
4. Cant Strips: Install preformed insulation cant strips at junctures of roofing system with vertical construction.

B. Insulation Thickness:
1. Thickness of roof insulation shown on drawings is nominal. Actual thickness shall provide the average thermal resistance "R" value of not less than that specified in Performance Requirements Article.
2. When thickness of insulation to be used is more or less than that shown on the drawings, make adjustments in the alignment and location of roof drains, flashing, gravel stops, fascias and similar items at no additional cost to the Government.
3. Where tapered insulation is used, the thickness of the insulation at high points and roof edges shall be as shown on the drawings; the thickness at the low point (drains) shall be not less than 38 mm (1 1/2 inches).
4. Use not less than two layers of insulation when insulation is 68 mm (2.7 inch) or more in thickness unless specified otherwise. Stagger joints minimum 150 mm (6 inches).

C. Lay insulating units with close joints, in regular courses and with cross joints broken. When laid in more than one layer, break joints of succeeding layers of roof insulation with those in preceding layer.

D. Lay units with long dimension perpendicular to the rolled (longitudinal) direction of the roofing felt.

E. Seal all cut edges at penetrations and at edges against blocking with bitumen or roof cement.

F. Cut to fit tight against blocking or penetrations.

G. Cover all insulation installed on the same day; comply with temporary protection requirements of Division 07 roofing section.

H. Installation Method:
1. Adhered Insulation:
   a. Prime substrate as required.
   b. Set each layer of insulation firmly in uniform application of full-spread insulation adhesive.
2. Mechanically Fastened Insulation:

a. Fasten insulation in accordance with FM Approval's "RoofNav" requirement in Division 07 roofing section.
b. Fasten insulation to resist uplift pressures specified in Division 07 roofing section.

3. Cover Board: Install cover boards over insulation with long joints in continuous straight lines with staggered end joints. Offset cover board joints from insulation joints minimum 150 mm (6 inches). Fasten cover boards according to "Adhered Insulation" requirements.

END OF SECTION

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 07 56 16.13

STYRENE - BUTADIENE - STYRENE MODIFIED BITUMIOUS MEMBRANE ROOFING, COLD-APPLIED

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section specifies modified bituminous sheet roofing and base flashing installed using cold-applied adhesive on existing construction with solar reflective granular coating.
B. This section specifies surveying of new roof surface to verify slopes to drains.

1.02 RELATED WORK:

A. General sustainable design documentation requirements: Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS.
B. Roof Insulation under Membrane: Section 07 22 00, ROOF AND DECK INSULATION.
C. Installation of temporary roof / vapor retarder: Section 07 22 00, ROOF AND DECK INSULATION.
D. Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.
E. Miscellaneous items: Section 07 71 00, ROOF SPECIALTIES.

1.03 APPLICABLE PUBLICATIONS:

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
B. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):
   1. ANSI/SPRI ES-1-03 Wind Design Standards for Edge Systems Used with Low Slope Roofing Systems
C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):
   1. ASCE/SEI-7-10 Minimum Design Loads for Buildings and Other Structures
D. Asphalt Roofing Manufacturers Association/National Roofing Contractors Association (ARMA/NRCA): Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing
E. ASTM International (ASTM):
   1. C1370-00(R2005) Standard Test Method for Determining the Chemical Resistance of Aggregates for Use in Chemical-Resistant Sulfur Polymer Cement Concrete and Other Chemical-Resistant Polymer Concretes
   2. C1371-04 Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers

3. C1549-04 Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer
4. D146-04 Standard Test Methods for Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing
5. D1644-01(R2006) Standard Test Methods for Nonvolatile Content of Varnishes
6. D2523-00(R2006) Standard Practice for Testing Load-Strain Properties of Roofing Membranes
7. D2823-05 Standard Specification for Asphalt Roof Coatings, Asbestos Containing
8. D3960-05 Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
9. D4073-06 Standard Test Method for Tensile-Tear Strength of Bituminuous Roofing Membranes
10. D4263-83(2005) Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
11. D4586-07 Asphalt Roof Cement, Asbestos Free
12. D4601-04 Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing
13. D4897-01 Asphalt Coated Glass Fiber Venting Base Sheet Used in Roofing
14. D5147-07 Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material
15. D5201-05(R2010) Standard Practice for Calculating Formulation Physical Constants of Paints and Coatings
16. D6162-00(R2008) Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements
17. D6163-00(2008) Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements
18. D6164-05 Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements
19. D6511-06 Standard Test Methods for Solvent Bearing Bituminous Compounds
20. E108-10 Standard Test Methods for Fire Tests of Roof Coverings
21. E408-71(R2008) Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques
22. E1918-06 Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field
23. E1980-01 Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field
24. WK 29032-10 Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer

F. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
1. ASHRAE 90.1-2007 Energy Standard for Buildings Except Low-Rise Residential Buildings, Appendix f.

G. Cool Roof Rating Council:
1. CRRC-1 Product Rating Program, www.coolroofs.org

H. FM Approvals: RoofNav Approved Roofing Assemblies and Products.
1. 4450 Approved Standard for Class 1 Insulated Steel Deck Roofs
2. 4470 Approved Standard for Class 1 Roof Coverings
3. 1-28 Loss Prevention Data Sheet: Design Wind Loads.
4. 1-49 Loss Prevention Data Sheet: Perimeter Flashing

I. National Roofing Contractors Association: Roofing and Waterproofing Manual
J. U.S. Environmental Protection Agency (EPA):
   1. EPA 600/R13/116 Method for the Determination of Asbestos in Bulk Building Materials
K. U.S. Department of Agriculture (USDA): USDA BioPreferred Catalog, www.biopreferred.gov
L. U.S. Department of Energy (DoE): Roof Products Qualified Product List, www.energystar.gov

1.04 PERFORMANCE REQUIREMENTS:

A. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
B. Roofing Membrane System Load-Strain Properties: Provide a roofing membrane identical to component systems that have been successfully tested by a qualified independent testing and inspecting agency to meet the following minimum load-strain properties at membrane failure when tested according to ASTM D2523:
   1. Tensile strain at failure, at 0 deg F (-18 deg C): 600 lbf(2.67 kN) cross machine direction, minimum; 4.0 to 5.5 percent elongation at break.
C. Roofing System Energy Performance Requirements: Provide a roofing system identical to components that that have been successfully tested by a qualified independent testing and inspecting agency to meet the following requirements:
   1. Energy Performance, Energy Star: Provide roofing system that is listed on DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.
   2. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.
   3. Energy Performance, CRRC-1: Provide roofing system with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 when tested according to CRRC-1.
   4. Energy Performance, Aged: Provide roofing system with minimum three-year aged solar reflectance not less than 0.55 when tested in accordance with ASTM C1549 or ASTM E1918, and in addition, a minimum three-year-aged thermal emittance of 0.75 when tested in accordance with ASTM C1371 or ASTM E408.
      a. Where tested aged values are not available for proposed product, submit calculations to adjust initial solar reflectance to demonstrate compliance as indicated in ASHRAE 90.1-2007 Addendum f.
      b. Alternatively, provide roofing system with minimum three-year aged Solar Reflectance Index of not less than 64 when determined in accordance with the Solar Reflectance Index method in ASTM E1980 using a convection coefficient of 2.1 BTU/h-ft2 (12 W/m2K).

1.05 QUALITY CONTROL:

A. Installer Qualifications:
   1. Licensed or approved in writing by manufacturer to perform work under warranty requirements of this Section.
   2. Employ full-time supervisors knowledgeable and experienced in roofing of similar types and scopes, and able to communicate with owner and workers.

B. Inspector Qualifications: Inspection of work by third-party technical inspector or technical representative of manufacturer experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:
   1. An authorized full-time technical employee of the manufacturer, not engaged in the sale of products.
   2. An independent party certified as a Registered Roof Observer by the Roof Consultants Institute (RCI), retained by the Contractor or the Manufacturer and approved by the Manufacturer.

C. Product/Material Qualifications:
   1. Obtain products from single manufacturer or from sources recommended by manufacturer for use with roofing system and incorporated in manufacturer's warranty.
   2. Provide manufacturer's certification that field applied bituminous coatings and mastics, and field applied roof coatings comply with limits for Volatile Organic Compounds (VOC) per the National Volatile Organic Compound Emission Standards for Architectural Coatings pursuant to Section 183(e) of the Clean Air Act with limits as follows:
      a. Bituminous Coatings and Mastics: 500 g/l (4.2 lb/gal.).
   3. Bio-Based Materials: Where applicable, provide products designated by USDA and meeting or exceeding USDA recommendations for bio-based content, and products meeting Rapidly Renewable Materials and certified sustainable wood content definitions; refer to www.biopreferred.gov.

D. Roofing system design standard requirements:
   1. Recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to modified bituminous sheet roofing for storage, handling and application.
   2. Recommendations of FM Approvals 1-49 Loss Prevention Data Sheet for Perimeter Flashings.
   3. Recommendations of ANSI/SPRI ES-1 for roof edge design.
   4. FM Approvals Listing: Provide roofing membrane, base flashing, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a roofing system and that are listed in FM Approvals "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
      a. Fire/Windstorm Classification: Class 1A-90.
      b. Hail Resistance: SH.
   5. High Wind Zone Design Requirement: Contractor Option: In lieu of FM Approval Listing windstorm classification, provide roofing membrane, base flashing, and component materials that comply with Miami-Dade County requirements.

E. Pre Roofing Meeting:
   1. Upon completion of roof deck installation and prior to any roofing application, hold a pre roofing meeting arranged by the Contractor and attended by the Roofing Inspector, Material Manufacturers Technical Representative, Roofing Applicator, Contractor, and Resident Engineer.
   2. Discuss specific expectations and responsibilities, construction procedures, specification requirements, application, environmental conditions, job and surface readiness, material storage, and protection.
   3. Inspect roof deck at this time to:
      a. Verify that work of other trades which penetrates roof deck is completed.

b. Determine adequacy of deck anchorage, presence of foreign material, moisture and unlevel surfaces, or other conditions that would prevent application of roofing system from commencing or cause a roof failure.
c. Examine samples and installation instructions of manufacturer.

F. Professional Land Surveyor: One who possesses a valid state license as a "Professional Land Surveyor" from the state in which they practice.

G. Professional Civil Engineer: One who possesses a valid license as a "Professional Civil Engineer" from the state in which they practice. For this section, the term "surveyor" shall also include Professional Civil Engineers authorized to practice Land Surveying under the laws of the state in which they practice.

1.06 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, SAMPLES.

B. Product Data:
1. Adhesive and asphalt materials.
2. Modified bituminous sheet roofing and flashing membrane.
3. Roofing adhesive.
4. Roof walkway.
5. Fastening requirements.
6. Application instructions.

C. Federal Sustainable Design Submittals:
1. Product Test: For roof materials, indicating that roof materials comply with Solar Reflectance Index requirement.
2. Product Data: For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
3. Product Data for Federally-Mandated Bio-Based Materials: For roof materials, indicating USDA designation and compliance with definitions for bio-based products, Rapidly Renewable Materials, and certified sustainable wood content.

D. Samples:
1. Nails and fasteners, each type.

E. Shop Drawings: Include plans, sections, details, and attachments.
1. Base flashings and terminations.
2. Nailers and cants.

F. Certificates:
1. Indicating materials and method of application of roofing system meets requirements of FM Approvals "RoofNav" for specified fire/windstorm classification.
2. Indicating compliance with Miami-Dade County requirements.
3. Indicating compliance with load/strain properties requirement.
4. Indicating compliance with energy performance requirement.

G. Warranty: As specified.

H. Documentation of supervisors' and inspectors' qualifications.

I. Field reports of roofing inspector.

J. Temporary protection plan. Include list of proposed temporary materials.

K. Contract Close-out Submittals:

1. Maintenance Manuals.
2. Warranty signed by installer and manufacturer.

L. Material Safety Data Sheets (MSDS): For all materials specified within this specification section.

1.07 DELIVERY, STORAGE AND MARKING:

A. Comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to built-up roofing for storage, handling and installation.

1.08 ENVIRONMENTAL REQUIREMENTS:

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

B. Environmental Controls: Refer to Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

C. Protection of interior spaces: Refer to Section 01 00 00, GENERAL REQUIREMENTS.

1.09 WARRANTY:

A. Roofing work subject to the terms of the Article "Warranty of Construction", FAR clause 52.246-21, except extend warranty period to 20 years from acceptance of facility by the Government

B. Roofing work shall be subject to manufacturer’s guaranteed roof drainage program.

PART 2 - PRODUCTS

2.01 ADHESIVE AND ASPHALT MATERIALS:

A. General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.
   1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
   2. Adhesives and sealants shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Roofing Membrane Adhesives: 0 g/L.
      b. Sealant Primers for Nonporous Substrates: 250 g/L.
      c. Sealant Primers for Porous Substrates: 775 g/L.

B. Water-Based Asphalt Primer: Water-based, polymer modified, asphalt primer with the following physical properties:
   1. Asbestos Content, EPA 600/R13/116: None.
   2. Non-Volatile Content, minimum, ASTM D2823: 30 percent.
   3. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 65 g/L.

C. Cold-Applied Adhesive for sheet membrane: One-part, asbestos-free, low-volatile, cold-applied adhesive specially formulated for compatibility and use with specified roofing membranes and flashings, with the following physical properties:

1. Asbestos Content, EPA 600 R13/116: None.
2. Volatile Organic Compounds (VOC), maximum, ASTM D6511: 205 g/L.
3. Nonvolatile Content, minimum, ASTM D6511: 75 percent.
4. Uniformity and Consistency, ASTM D6511: Pass.

D. Cold-Applied Adhesive for membrane flashing: One-part, cold-applied adhesive specially formulated for compatibility and use with specified roofing membranes and flashings, with the following physical properties:
1. Asbestos Content, EPA 600 R13/116: None.
2. Volatile Organic Compounds (VOC), maximum, ASTM D6511: 205 g/L.
3. Nonvolatile Content, minimum, ASTM D6511: 75 percent.
4. Uniformity and Consistency, ASTM D6511: Pass.

E. Roof Cement: ASTM D4586, Type II.

2.02 MEMBRANE AND SHEET MATERIALS:

A. Membrane Materials, General: Provide combination of base, ply, and cap sheet materials that have been tested in combination and comply with load/strain properties performance requirement in Part 1 of this Section.

B. Base Sheet: ASTM D4601, Type II, nonperforated, asphalt-impregnated and coated glass-fiber sheet dusted with fine mineral surfacing on both sides, with the following properties:
1. Breaking Strength, minimum, ASTM D146: cross machine direction, 12.2 kN/m (70 lbf/in).
2. Pliability, 12.7 mm (1/2 inch) radius bend, ASTM D146: No failures.

C. Membrane Ply Sheet: ASTM D6163, Grade S, Type II or III, glass-fiber-reinforced, SBS/SEBS-modified asphalt sheet, or ASTM D6162, Grade S, Type II or III, SBS/SEBS-modified asphalt sheet; smooth surfaced; suitable for application method specified, with the following minimum properties:
1. Tensile Strength at 23 deg. C (73 deg. F), minimum, cross machine direction, ASTM D5147: 21 kN/m (120 lbf/in).
2. Tear Strength at 23 deg. C (73 deg. F), minimum, cross machine direction, ASTM D5147: 890 N (200 lbf).
3. Elongation at 23 deg. C (73 deg. F), minimum, cross machine direction, at 5 percent maximum load ASTM D5147: 40 percent.

D. Membrane Cap Sheet: ASTM D6163, Grade G, Type II, glass-fiber-reinforced, SBS-modified asphalt sheet; granular surfaced with a factory applied, white, reflective, acrylic coating; CRRC listed and California Title 24 Energy Code compliant; and as follows:
1. Exterior Fire-Test Exposure, ASTM E108: Class A.
2. Tensile Strength at 23 deg. C (73 deg. F), minimum, cross machine direction, ASTM D5147: 12.2 kN/m (70 lbf/in).
3. Tear Strength at 23 deg. C (73 deg. F), minimum, cross machine direction, ASTM D5147: 440 N (100 lbf).
4. Elongation at 23 deg. C (73 deg. F), minimum, cross machine direction, ASTM D5147: 7.5 percent.
5. Low Temperature Flex, maximum, ASTM D5147, -26 deg. C (-15 deg. F).
6. Reflectance, ASTM C1549: 71 percent.
7. Thermal Emittance, ASTM C1371: 0.87.
8. Solar Reflectance Index (SRI), ASTM E1980: 87.

E. Base Flashing Backer Sheet: ASTM D4601, Type II, asphalt-impregnated and coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.
F. Base Flashing Sheet: ASTM D6164, Grade G, Type II, polyester-reinforced, SBS-modified asphalt sheet; granular surfaced; Granule Color: White.
G. Temporary Roof / Vapor Retarder: ASTM D6222, Type I, Grade S, nonperforated, asphalt-impregnated and coated glass-fiber sheet dusted with fine mineral surfacing on both sides.

2.03 FASTENERS:

A. Roofing Fasteners: Factory-coated steel fasteners and metal or plastic plates, where applicable, meeting requirements of FM Approvals 4470, tested by fastener manufacturer for required pullout strength, and recommended by roofing manufacturer for application.
B. Accessory Fasteners: Corrosion-resistant fasteners compatible with adjacent materials and recommended for application by manufacturer of component to be fastened.

2.04 ROOF WALKWAY:

A. Prefabricated asphalt plank consisting of a homogeneous core of asphalt, plasticizers and inert fillers, bonded by heat and pressure between two saturated and coated sheets of felt:
   1. Top side of plank surfaced with ceramic granules. Granule Color: White.
   2. Size: Minimum 13 mm (1/2 inch) thick, manufacturer's standard size, but not less than 300 mm (12 inches) in least dimension and 600 mm (24 inches) in length.

2.05 ACCESSORIES:

A. Liquid Flashing System. Two-part fully reinforced PMMA liquid flashing system as furnished or approved for use by the roof system manufacture. Liquid flashings are to be included in the roof system warranty. Volatile Organic Compounds (VOC), maximum: Primer, 743 g/L; Liquid Applied Flashing, 88 g/L.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions with roofing Installer and roofing inspector to verify compliance with project requirements and suitability to accept subsequent roofing work. Correct unsatisfactory conditions before proceeding with roofing work.
B. Do not apply roofing if roof surface will be used for subsequent work platform, storage of materials, or staging or scaffolding will be erected thereon unless system is protected.

3.02 PREPARATION

A. Complete roof deck construction prior to commencing roofing work:
   1. Install curbs, blocking, edge strips, nailers, cants, and other components where insulation, roofing, and base flashing is attached to, in place ready to receive insulation and roofing.

2. Complete deck and insulation to provide designed drainage to working roof drains.
3. Document installation of related materials to be concealed prior to installing roofing work.

B. Dry out surfaces, including the flutes of metal deck that become wet from any cause during progress of the work before roofing work is resumed. Apply materials to dry substrates.

C. Sweep decks to broom clean condition. Remove all dust, dirt or debris.

D. Remove projections that might damage materials.

E. Concrete Decks, except Insulating Concrete:
1. Test concrete decks for moisture prior to application of roofing materials. Test for capillary moisture by plastic sheet method according to ASTM D4263.
2. Prime concrete decks, including precast units, with primer as specified. Keep primer back four inches from joints in precast units.
3. Allow primer to dry before application of bitumen.

F. Existing Membrane Roofs and Repair Areas:
1. Comply with requirements in Section 07 01 50.19 PREPARATION FOR REROOFING.
2. At areas to be altered or repaired, remove loose, damaged, or cut sheet that is not firmly adhered only where new penetrations occur or repairs are required.
3. Cut and remove existing roof membrane for new work to be installed. Clean cut edges and install a temporary seal to cut surfaces. Use roof cement and one layer of 7 Kg (15 pound) felt strip cut to extend 150 mm (6 inches) on each side of cut surface. Bed strip in roof cement and cover strip with roof cement to completely embed the felt.
4. At modified bituminous base flashing to be repaired, either bend up cap flashing or temporarily remove cap flashing. Brush and scrape away all deteriorated sheets or surface material of base flashing.

3.03 TEMPORARY PROTECTION

A. Install temporary protection at the end of day's work and when work is halted for an indefinite period or work is stopped when precipitation is imminent. Comply with approved temporary protection plan.

B. B. Install temporary cap flashing over the top of base flashings where permanent flashings are not in place to provide protection against moisture entering the roof system through or behind the base flashing. Securely anchor in place to prevent blow off and damage by construction activities.

C. Provide for removal of water or drainage of water away from the work.

D. Provide temporary protection over installed roofing by means of duckboard walkways, plywood platforms, or other materials, as approved by Resident Engineer, for roof areas that are to remain intact, and that are subject to foot traffic and damage. Provide notches in sleepers to permit free drainage.

3.04 INSTALLATION, GENERAL

A. FM Approvals Installation Standard: Install roofing membrane, base flashings, wood cants, blocking, curbs, and nailers, and component materials in compliance with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system as listed in FM Approval's "RoofNav" for fire/windstorm classification indicated. Comply with recommendations in FM Approvals' Loss Prevention Data Sheet 1-49, including requirements for wood nailers and cants.

B. NRCA Installation Standard: Install roofing system in accordance with applicable NRCA Manual Plates and NRCA recommendations, including ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing"

C. Manufacturer Recommendations: Comply with roofing system manufacturer's written installation recommendations.

D. Coordination with related work: Coordinate roof operations with roof insulation and sheet metal work so that insulation and flashings are installed concurrently to permit continuous roofing operations.

E. Installation Conditions:
   1. Apply dry roofing materials. Apply roofing work over dry substrates and materials.
   2. Apply materials within temperature range and surface and ambient conditions recommended by manufacturer.
   3. Except for temporary protection, do not apply materials during damp or rainy weather, during excessive wind conditions, nor while moisture (dew, snow, ice, fog or frost) is present in any amount in or on the materials to be covered or installed:
      a. Do not apply materials when the temperature is below 4 deg. C (40 deg. F).
      b. Do not apply materials to substrate having temperature of 4 deg. C (40 deg. F) or less.

3.05 INSTALLATION OF MODIFIED BITUMEN MEMBRANE:

A. Primer: Apply primer to substrates where recommended by roofing manufacturer, in application quantities recommended by roofing manufacturer.

B. Cold-Applied Adhesive: Apply cold-applied adhesive in application quantities recommended by roofing manufacturer at substrate, between membrane sheets, and as glaze coat where required.

C. Membrane Sheets:
   1. Number of Plies: 2, minimum, including base sheet and cap sheet, and additional plies as required to meet load/strain properties specified in Part 1 of this Section.
   2. Commence the laying of sheets at the low points.
   3. Roll sheets into cold-applied adhesive brushing down to firmly embed, free of wrinkles, fish mouths, blisters, bubbles, voids, air pockets or other defects that prevent complete adhesion:
   4. Cut to fit closely around pipes, roof drains, bitumen stops, and similar roof projections.
   5. Lap sheets shingle fashion starting with starter strips at right angles to slope of roof.
   6. Laps for Top Sheet and Base Sheet:
      a. Base sheet, lapped 75 mm (three inches).
      b. Use 450 mm (18 inch) starting widths, lap top sheet 475 mm (19 inches).
   7. Lap end joints of sheet 150 mm (six inches). Stagger end joints in relation to end joints in adjacent and proceeding plies.

D. Roof edges and terminations:
   1. Where nailers occur at roof edges under gravel stops or penetrations to receive metal base flashing, apply a continuous strip of underlayment over the nailers before the first ply sheet is applied. Strip shall be installed on top of venting base sheet if any.
   2. After membrane is installed, turn the underlayment back over the roofing, and secure in place with cold-applied adhesive before gravel stops or other metal flanges extending out onto the membrane are installed.
   3. Where cants occur at vertical surfaces, cut off roofing sheets two inches above top of cant strips, except at prefabricated curbs, scuttles and other roof accessories having integral cants, extend membrane over cant and up vertical surface to top of curb or nailer as shown.

4. Where fascia cant occurs at roof edges, extend membrane beyond outside cant face and cut off at outside after base flashing is installed.
5. Where reglet occurs at vertical surfaces, extend plies roofing sheets up into reglet the full depth of the reglet.

3.06 BASE FLASHING:

A. Provide built up base flashing over cants and as necessary to make work watertight.
B. Prime vertical surfaces of masonry and concrete with asphalt primer except where vented base sheet is required to provide edge venting.
C. Apply flashing on top of roofing, up face of cant and up the face of the vertical surface, at least 200 mm (eight inches) above the roofing but not more than 350 mm (14 inches) above the roofing, generally full height beneath counter flashing or top of curb flashing.
   1. At fascia cants, extend to top of cant and cut off at top of cant.
   2. At reglet, extend full depth into the reglet.
   3. Where venting base sheet is used with insulating concrete, do not seal edges of venting base sheet with bitumen; allow for venting.
D. Use two plies of modified bituminous sheet.
   1. Extend the first ply 100 mm (four inches) out on the roofing, and the second ply 75 mm (three inches) beyond the first ply. Lap ends 75 mm (three inches) with joints broken 450 mm (18 inches) in each ply. Use smooth surface modified bituminous sheet for first ply.
   2. Use granular surfaced modified bitumen cap sheet.
E. Set base flashing in a solid application of cold-applied adhesive.
   1. Set cap sheet in cold-applied adhesive with laps sealed with cold-applied adhesive.
   2. Except for venting roof edges, seal the top edge of the base flashing with roof cement.
F. Except at metal fascia cants, secure top edge of base flashing with nails on a line approximately 25 mm (one inch) below top edge, spaced not more than 200 mm (eight inches) on center.
   1. Cover nail heads with roof cement.
   2. Cover the top of the base flashing with counterflashing as specified in Section 07 60 00, FLASHING AND SHEET METAL. At the fascia cants secure the top edge of the flashing with fascia compression clamp as specified in Section 07 60 00, FLASHING AND SHEET METAL.

3.07 STRIPPING:

A. Coordinate to set flanges of metal flashing in roof cement on top sheet of the modified bituminous roofing and mailing to blocking with Section 07 60 00, FLASHING AND SHEET METAL.
B. Cover that portion of the horizontal flanges of metal base flashings, gravel stops, and other flanges extending out onto the roofing with modified bituminous sheet.
C. Extend the sheet out on the roofing 150 mm six inches beyond the edge of the metal flange. Cut edge to fit tight against vertical members of flange.
D. Prime flange before stripping, embed sheet in cold-applied adhesive.

3.08 ROOF WALKWAYS:

A. Install roof walkways where indicated.

B. Set prefabricated planks in solid application of cold-applied adhesive. Maintain 75 mm (three inch) to 150 mm (six inch) space between planks.

3.09 FIELD QUALITY CONTROL:

A. Roofing Inspector: Owner will engage a qualified roofing inspector to perform roof tests and inspections and to prepare test reports.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
   1. Notify Architect and Owner 48 hours in advance of date and time of inspection.

C. Repair or remove and replace components of roofing work where test results or inspections indicate that they do not comply with specified requirements.
   1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

D. Survey of Roof Slopes: Following installation of new roofing system, a survey shall be performed in accordance with the current "Accuracy Standards for Land Title Surveys" as adopted, from time to time, by the American Congress on Surveying and Mapping, the National Society of Professional Surveyors, and the American Land Title Association.
   1. The surveyor, when applicable, shall consult with the project Architect to determine scale and size of drawings.
   2. In the survey, the scale shall be clearly indicated. A graphic scale, shown in feet, shall te included. A north arrow shall be shown and when practicable, the survey shall be oriented so that north is at the top of the drawing. Symbols or abbreviations used shall be identified on the face of the survey by use of a legend or other means.
   3. The survey shall include contain the following applicable information:
      a. the name, address, telephone number, and signature of the Professional Surveyor who made the survey, his or her official seal and registration number, the date the survey was completed and the dates of all revisions.
      b. the survey drawing(s) submitted shall bear the following certification adjacent to the Engineers official seal:"I hereby certify that all information indicated on this drawing was obtained or verified by actual measurements in the field and that every effort has been made to furnish complete and accurate information."
      c. Spot elevations every 5'-0" o.c. in each direction.

3.10 PROTECTION AND CLEANING:

A. Protect membrane roofing system from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of acceptance by Owner.

C. Clean overspray and spillage from adjacent construction. Clean membrane and restore surface to like-new condition meeting solar reflectance requirements.

END OF SECTION

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 07 60 00

MASONRY FLASHINGS AND SHEET METAL

PART 1 - GENERAL

1.01 DESCRIPTION

D. Furnish all labor, materials, tools and equipment and perform all work necessary for and incidental to providing flashing and sheet metal as shown on the Drawings and specified herein; in accordance with the provisions of the Contract Requirements - Division 0, General Requirements - Division 1 and completely coordinated with the Work of all other trades.

E. Work included but not limited to:
   1. New through-wall flashings
   2. New miscellaneous flashings
   3. New coping (at northwest corner rebuild)

F. Related work specified elsewhere:
   1. Section 02 41 10 - Selective Demolition
   2. Section 04 20 00 - Brick Masonry
   3. Section 07 92 00 - Sealants and Caulking

1.02 QUALITY ASSURANCE

A. Use skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
B. Contractor's Qualifications: Have installations of the specified materials in the local area for a minimum period of five years.
C. Reference Standards: Except as modified by the Drawings and Specifications, the following documents, or applicable portions thereof, govern the work.
   1. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) "Architectural Sheet Metal Manual - Fourth Edition."

1.03 WORK SEQUENCE

A. Conduct all work under temperature and climatic conditions as recommended by standard practice and manufacturer's recommendations.
B. Do not install new sheet metal when precipitation is imminent.
C. Installation of new sheet metal and flashing shall be coordinated with the Work of all other trades.

1.04 SUBMITTALS

A. Required prior to the commencement of work:
   1. Detailed shop drawings and full-sized mockups, 12 in. wide minimum, of all new sheet metal.
   2. Prefinished metal color chart.

1.05 PRODUCT DELIVERY, HANDLING AND STORAGE

A. All materials shall be delivered to the job site in manufacturer's sealed packaging and stored in an enclosed shelter providing protection from damage and exposure to the elements. Damaged or deteriorated materials shall be removed from the premises.

1.06 LICENSED ENGINEER'S OBSERVATIONS

A. All through-wall flashing repairs are to be observed by the Licensed Engineer prior to installing masonry. Contractor is to notify Licensed Engineer 3 days in advance to schedule site visit.

1.07 GUARANTEE

A. Contractor's Guarantee:
   1. By the sheet metal contractor
   2. Time Period: Two years after the date of completion and acceptance by the Owner
   3. Terms: All materials, labor, tools and equipment necessary for repair, restoration, or replacement of all new work damaged as a result of:
      a. Defects, imperfections, or faults in:
         1) Materials
         2) Workmanship.
      b. Contractors correcting defects, imperfections, or faults in materials and/or workmanship.
   4. Corrections of defects, imperfections, and faults shall not relieve the Contractor from his responsibility for additional corrective work during the remaining time period.

1.08 STORAGE

A. Store all products in a manner to prevent damage, in a secure place, out of the way of construction operations. Provide protection until ready to use.
B. Handle all flashing with care as not to damage.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Sheet Metal Stock:
   1. Metal Flashing or Coping: Prefinished aluminum flashing: "PAC-CLAD" prefinished aluminum, 0.050 in. thick, as manufactured by Petersen Aluminum Corporation, Elk Grove Village, Illinois or

equivalent manufacturer as approved by Owner and Architect/Engineer. Color to be selected by Owner from manufacturer's standard colors. Coating is to be "Kynar 500" based paint.

B. Fasteners:
   1. Sheet metal flashing to masonry: Unless otherwise noted, "Rawl Zamac Nailin" fasteners 1/4 in. x 1 in. (minimum) with nylon mushroom head and with a stainless steel nail as manufactured by Rawl Plug Co. Spacing shall be at 8 in. on center maximum.
      a. Exposed fasteners shall be capped with sealant.
   2. Sheet metal flashing to masonry: Where noted, 1/4 in. diameter by 2 1/4 in. long stainless steel "Tapper" with EPDM bonded washer as manufactured by the Rawl Plug Co. Fastener shall be hex head.
   3. New or existing sheet metal to wood: "TruGrip" stainless steel wood fasteners with HWH with "Maxiseal" integral head and EPDM sealing washer as manufactured by ITW Buildex. Size shall be sufficient to engage wood at existing holes.
   4. Metal to Metal: "Teks" fasteners, 10 - 16 x 3/4 in. HWH Teks/1 with an EPDM sealing washer, as manufactured by ITW Buildex.

C. Miscellaneous Accessories:

   1. Sealant: See Section 07920, Sealants and Caulking.
   2. Self-Adhering Flashing Membrane and Accessories: Perm-A-Barrier Wall Flashing, Primer and Bituthene Elastomeric Mastic EM3000, as manufactured by W. R. Grace & Co., Cambridge, MA.
   3. Wood Blocking (if required): Treated No. 2 "Wolmanized" dimensional lumber.

2.02 FABRICATION

A. Field document the required configuration and measurements of all new flashings prior to fabrication.
B. Shop fabricate new sheet metal shapes in 10 ft long sections, or as long as practical.
C. Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
D. All splices are to be designed to allow for the expected thermal movement of the material.
E. Provide other materials not specifically described but required for a complete and proper installation as selected by the Contractor subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate sheet metal operations with the work of all other trades.

3.02 PREPARATION OF SUBSTRATE

A. Examine the surface condition of the substrate under which sheet metal is to be installed. Report to the Owner's Representative in writing all conditions that would adversely affect installation of the work. Do not proceed with the new installation until unsatisfactory conditions have been corrected in a manner approved by the Owner's Representative.
B. Clean the substrate of obstructions and substances detrimental to the work.
C. Proceeding with the work shall signify the Contractor's acceptance of the substrate being covered by the new sheet metal installation.

3.03 INSTALLATION OF SHEET METAL

A. General:
   1. Install members and components in strict accordance with arrangements shown on the Drawings.
   2. Erect all members plumb, level and in line securely anchored and properly related to other parts of the Work.
   3. Dissimilar Metals: Separate dissimilar metals by bonding membrane to the matching surfaces
   4. Install sealant cover over all exposed fasteners
   5. Lap seams in flashing shall be 6 in. minimum and shall, as a minimum, form watertight joint by sealing with butyl sealant in (5) parallel transverse lines of sealant extending from top of counter flashing to drip.
B. Masonry Through-Wall Flashing:
   1. Install self-adhering flashing membrane and related accessories as shown on the Drawings and in accordance with manufacturer's recommendations. Prevent contact between self-adhering flashing membrane and sealants. Notify Architect/Engineer of any locations where contact cannot be prevented.

3.04 ADJUST/CLEAN

A. Upon completion, carefully examine all flashing and trim work. Remove all damaged and defective work and replace with new materials.
B. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
C. Remove trash, debris, and equipment from the job site.
D. Repair damage and remove stains caused by the work.

3.05 PROTECTION

A. Protect installed work during remainder of construction period. Ensure that it will be without damage or deterioration (other than normal weathering) at substantial completion.

END OF SECTION

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 07 60 10

ROOFING FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Formed sheet metal work for wall and roof flashing, copings, roof edge metal, fasciae, drainage specialties, and formed expansion joint covers are specified in this section.

1.02 RELATED WORK

A. Manufactured flashing, copings, roof edge metal, and fasciae: Section 07 71 00 ROOF SPECIALTIES.Contractor's Qualifications: Have installations of the specified materials in the local area for a minimum period of five years.
B. Membrane base flashings and stripping: Section 07 52 16.13 SBS MODIFIED BITUMINOUS MEMBRANE ROOFING, COLD APPLIED.
C. Flashing components of factory finished roofing and wall systems: Division 07 roofing and wall system sections.
D. Joint Sealants: Section 07 92 00, JOINT SEALANTS.
E. Integral flashing components of manufactured roof specialties and accessories or equipment: Section 07 71 00, ROOF SPECIALTIES, Division 22, PLUMBING sections and Division 23 HVAC sections.

1.03 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
B. Aluminum Association (AA):
   1. AA-C22A41 Aluminum Chemically etched medium matte, with clear anodic coating, Class I Architectural, 0.7-mil thick
   2. AA-C22A42 Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 0.7 mils thick
   3. AA-C22A44 Chemically etched medium matte with electrolytically deposited metallic compound, integrally colored coating Class I Architectural, 0.7-mil thick finish
C. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):
   1. ANSI/SPRI ES-1-03 Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems
D. American Architectural Manufacturers Association (AAMA):
   1. AAMA 620 Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Aluminum

2. AAMA 621 Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates

E. ASTM International (ASTM):
1. A167-99(R2009) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
2. A653/A653M-09 Steel Sheet Zinc-Coated (Galvanized) or Zinc Alloy Coated (Galvanized) by the Hot- Dip Process
3. B32-08 Solder Metal
4. B209-07 Aluminum and Aluminum-Alloy Sheet and Plate
5. B370-09 Copper Sheet and Strip for Building Construction
6. D173-03 Bitumen-Saturated Cotton Fabrics Used in Roofing and Waterproofing
7. D412-06 Vulcanized Rubber and Thermoplastic Elastomers-Tension
8. D1187-97(R2002) Asphalt Base Emulsions for Use as Protective Coatings for Metal
9. D1784-08 Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
10. D3656-07 Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns
11. D4586-07 Asphalt Roof Cement, Asbestos Free

F. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual.

G. National Association of Architectural Metal Manufacturers (NAAMM): AMP 500-06 Metal Finishes Manual

H. Federal Specification (Fed. Spec):
1. A-A-1925A Shield, Expansion; (Nail Anchors)
2. UU-B-790A Building Paper, Vegetable Fiber

I. International Code Commission (ICC): International Building Code, Current Edition

1.04 Performance Requirements

A. Wind Uplift Forces: Resist the following forces per FM Approvals 1-49:
1. Wind Zone 2: 1.48 to 2.15 kPa (31 to 45 lbf/sq. ft.): 4.31-kPa (90-lbf/sq. ft.) perimeter uplift force, 5.74-kPa (120-lbf/sq. ft.) corner uplift force, and 2.15-kPa (45-lbf/sq. ft.) outward force.

B. Wind Design Standard: Fabricate and install copings and roof-edge flashings tested per ANSI/SPRI ES-1 to resist design pressure as indicated above.

1.05 Submittals

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings: For all specified items, including:
1. Flashings
2. Copings
3. Expansion joints

C. Manufacturer's Literature and Data: For all specified items, including:
1. Thru wall flashing

D. Certificates: Indicating compliance with specified finishing requirements, from applicator and contractor.

PART 2 - PRODUCTS

2.01 FLASHING AND SHEET METAL

A. Stainless Steel: ASTM A167, Type 302B, dead soft temper.
B. Copper ASTM B370, cold-rolled temper.
C. Aluminum Sheet: ASTM B209, alloy 3003-H14 //except alloy used for color anodized aluminum shall be as required to produce specified color. Alloy required to produce specified color shall have the same structural properties as alloy 3003-H14//.

2.02 FLASHING ACCESSORIES

A. Solder: ASTM B32; flux type and alloy composition as required for use with metals to be soldered.
B. Rosin Paper: Fed-Spec. UU-B-790, Type I, Grade D, Style 1b, Rosin-sized sheathing paper, weighing approximately 3 Kg/10 m² (6 lbs/100 sf).
C. Bituminous Paint: ASTM D1187, Type I.
D. Fasteners:
    1. Use stainless steel for stainless steel and aluminum alloy
    2. Nails:
        a. Minimum diameter for aluminum nails 3 mm (0.105 inch).
        b. Minimum diameter for stainless steel nails: 2 mm (0.095 inch) and annular threaded.
        c. Length to provide not less than 22 mm (7/8 inch) penetration into anchorage.
    3. Rivets: Not less than 3 mm (1/8 inch) diameter.
    4. Expansion Shields: Fed Spec A-A-1925A.
E. Sealant: As specified in Section 07 92 00, JOINT SEALANTS for exterior locations.
F. Insect Screening: ASTM D3656, 18 by 18 regular mesh.
G. Roof Cement: ASTM D4586.

2.03 SHEET METAL THICKNESS

A. Except as otherwise shown or specified use thickness or weight of sheet metal as follows:
B. Concealed Locations (Built into Construction):
    1. Stainless steel: 0.25 mm (0.010 inch) thick.
C. Exposed Locations:
    1. Stainless steel: 0.4 mm (0.015 inch).
D. Thickness of aluminum is specified with each item.

2.04 FABRICATION, GENERAL

A. Jointing:
    1. In general, stainless steel joints, except expansion and contraction joints, shall be locked and soldered.
    2. Joints shall conform to following requirements:
        a. Flat-lock joints shall finish not less than 19 mm (3/4 inch) wide.

b. Lap joints subject to stress shall finish not less than 25 mm (one inch) wide and shall be soldered and riveted.
c. Unsoldered lap joints shall finish not less than 100 mm (4 inches) wide.

3. Flat and lap joints shall be made in direction of flow.
4. Soldering:
   a. Pre tin both mating surfaces with solder for a width not less than 38 mm (1 1/2 inches) stainless steel.
   b. Treat in accordance with metal producers recommendations other sheet metal required to be soldered.
   c. Completely remove acid and flux after soldering is completed.

B. Expansion and Contraction Joints
1. Fabricate in accordance with the Architectural Sheet Metal Manual recommendations for expansion and contraction of sheet metal work in continuous runs.
2. Space joints as shown or as specified.
3. Space expansion and contraction joints for stainless steel at intervals not exceeding 7200 mm (24 feet).
4. Space expansion and contraction joints for aluminum at intervals not exceeding 5400 mm (18 feet), except do not exceed 3000 mm (10 feet) for gravel stops and fascia-cant systems.
5. Fabricate slip-type or loose locked joints and fill with sealant unless otherwise specified.
6. Fabricate joint covers of same thickness material as sheet metal served.

C. Cleats:
1. Fabricate cleats to secure flashings and sheet metal work over 300 mm (12 inches) wide and where specified.
2. Provide cleats for maximum spacing of 300 mm (12 inch) centers unless specified otherwise.
3. Form cleats of same metal and weights or thickness as the sheet metal being installed unless specified otherwise.
4. Fabricate cleats from 50 mm (2 inch) wide strip. Form end with not less than 19 mm (3/4 inch) wide loose lock to item for anchorage. Form other end of length to receive nails free of item to be anchored and end edge to be folded over and cover nail heads.

D. Drips:
1. Form drips at lower edge of sheet metal counter-flashings (cap flashings), fascias, gravel stops, wall copings, by folding edge back 13 mm (1/2 inch) and bending out 45 degrees from vertical to carry water away from the wall.
2. Form drip to provide hook to engage cleat or edge strip for fastening for not less than 19 mm (3/4 inch) loose lock where shown.

E. Edges:
1. Edges of flashings concealed in masonry joints opposite drain side shall be turned up 6 mm (1/4 inch) to form dam, unless otherwise specified or shown otherwise.
2. Finish exposed edges of flashing with a 6 mm (1/4 inch) hem formed by folding edge of flashing back on itself when not hooked to edge strip or cleat. Use 6 mm (1/4 inch) minimum penetration beyond wall face with drip for through-wall flashing exposed edge.
3. All metal roof edges shall meet requirements of IBC, current edition.

F. Metal Options:
1. Where options are permitted for different metals use only one metal throughout.
2. Stainless steel may be used in concealed locations for fasteners of other metals exposed to view.

3. Where copper gravel stops, copings and flashings will carry water onto cast stone, stone, or architectural concrete, or stainless steel.

2.05 FINISHES

A. Use same finish on adjacent metal or components and exposed metal surfaces unless specified or shown otherwise.
B. In accordance with NAAMM Metal Finishes Manual AMP 500, unless otherwise specified.
C. Finish exposed metal surfaces as follows, unless specified otherwise:
   1. Stainless Steel: Finish No. 2B or 2D.
   2. Aluminum:
      a. Fluorocarbon Finish: AAMA 620, high performance organic coating.

2.06 COUNTERFLASHING

A. Stainless steel, unless specified otherwise.
B. Fabricate to lap base flashing a minimum of 100 mm (4 inches) with drip:
   1. Form lock seams for outside corners. Allow for lap joints at ends and inside corners.
   2. In general, form flashing in lengths not less than 2400 mm (8 feet) and not more than 3000 mm (10 feet).
   3. Two-piece, lock in type flashing may be used in-lieu-of one piece counter-flashing.
   4. Manufactured assemblies may be used.
   5. Where counterflashing is installed at new work use an integral flange at the top designed to be extended into the masonry joint or reglet in concrete.
   6. Where counterflashing is installed at existing work use surface applied type, formed to provide a space for the application of sealant at the top edge.
C. Surface Mounted Counterflashing; one or two piece:
   1. Use at existing or new surfaces where flashing cannot be inserted in vertical surface.
   2. One piece fabricate upper edge folded double for 65 mm (2 1/2 inches) with top 19 mm (3/4 inch) bent out to form "V" joint sealant pocket with vertical surface. Perforate flat double area against vertical surface with horizontally slotted fastener holes at 400 mm (16 inch) centers between end holes. Option: One piece surface mounted counter-flashing (cap flashing) may be used. Fabricate as detailed on Plate 51 of SMACNA Architectural Sheet Metal Manual.
   3. Two pieces: Fabricate upper edge to lock into surface mounted receiver. Fabricate receiver joint sealant pocket on upper edge and lower edge to receive counterflashing, with slotted fastener holes at 400 mm (16 inch) centers between upper and lower edge.
D. Pipe Counterflashing:
   1. Form flashing for water-tight umbrella with upper portion against pipe to receive a draw band and upper edge to form a "V" joint sealant receiver approximately 19 mm (3/4 inch) deep.
   2. Fabricate 100 mm (4 inch) over lap at end.
   3. Fabricate draw band of same metal as counter flashing. Use 0.6 Kg (24 oz) copper or 0.33 mm (0.013 inch) thick stainless steel.
   4. Use stainless steel bolt on draw band tightening assembly.
   5. Vent pipe counter flashing may be fabricated to omit draw band and turn down 25 mm (one inch) inside vent pipe.

6. Where vented edge decks intersect vertical surfaces, form in one piece, shape to slope down to a point level with and in front of edge-set notched plank; then, down vertically, overlapping base flashing.

2.07 INSULATED EXPANSION JOINT COVERS

A. Either type optional, use only one type throughout.
B. Types:
   1. Construct of two preformed, stainless steel strips, not less than 0.4 mm (0.015 inch) thick, mechanically and adhesively bonded to both sides of a 2 mm (1/16 inch) thick neoprene or butyl sheet, or to a 0.4 mm (32 mil) thick reinforced chlorinated polyethylene sheet. Adhesively attach a 10 mm (3/8 inch) thick sheet of closed cell, neoprene foam insulation, to the underside of the neoprene, butyl, or chlorinated polyethylene sheet.
   2. Constructed of a 2 mm (1/16 inch) thick vinyl sheet, flanged at both sides with stainless steel strips not less than 0.4 mm (0.015 inch) thick. Vinyl sheet locked and encased by the stainless steel strip and prepunched for nailing. A 10 mm (3/8 inch) thick closed cell polyvinyl chloride foam insulating strip shall be heat laminated to the underside of the vinyl sheet between the stainless steel strips.
C. Expansion joint covers shall have factory fabricated mitered corners, crossing tees, and other necessary accessories. Furnish in the longest available lengths.
D. Metal flange of sufficient width to extend over the top of the curb and down curb sides 50 mm (2 inches) with hemmed edge for lock to edge strip.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General:
   1. Install flashing and sheet metal items as shown in Sheet Metal and Air Conditioning Contractors National Association, Inc., publication, ARCHITECTURAL SHEET METAL MANUAL, except as otherwise shown or specified.
   2. Apply Sealant as specified in Section 07 92 00, JOINT SEALANTS.
   3. Apply sheet metal and other flashing material to surfaces which are smooth, sound, clean, dry and free from defects that might affect the application.
   4. Remove projections which would puncture the materials and fill holes and depressions with material compatible with the substrate. Cover holes or cracks in wood wider than 6 mm (1/4 inch) with sheet metal compatible with the roofing and flashing material used.
   5. Coordinate with masonry work for the application of a skim coat of mortar to surfaces of unit masonry to receive flashing material before the application of flashing.
   6. Apply a layer of 7 Kg (15 pound) saturated felt followed by a layer of rosin paper to wood surfaces to be covered with copper. Lap each ply 50 mm (2 inch) with the slope and nail with large headed copper nails.
   7. Confine direct nailing of sheet metal to strips 300 mm (12 inch) or less wide. Nail flashing along one edge only. Space nail not over 100 mm (4 inches) on center unless specified otherwise.

8. Install bolts, rivets, and screws where indicated, specified, or required in accordance with the SMACNA Sheet Metal Manual. Space rivets at 75 mm (3 inch) on centers in two rows in a staggered position. Use neoprene washers under fastener heads when fastener head is exposed.
9. Coordinate with roofing work for the installation of metal base flashings and other metal items having roof flanges for anchorage and watertight installation.
10. Nail continuous cleats on 75 mm (3 inch) on centers in two rows in a staggered position.
11. Nail individual cleats with two nails and bend end tab over nail heads. Lock other end of cleat into hemmed edge.
12. Install flashings in conjunction with other trades so that flashings are inserted in other materials and joined together to provide a water tight installation.
13. Where required to prevent galvanic action between dissimilar metal isolate the contact areas of dissimilar metal with sheet lead, waterproof building paper, or a coat of bituminous paint.
14. Isolate aluminum in contact with dissimilar metals others than stainless steel, white bronze or other metal compatible with aluminum by:
    a. Paint dissimilar metal with a prime coat of zinc-chromate or other suitable primer, followed by two coats of aluminum paint.
    b. Paint dissimilar metal with a coat of bituminous paint.
    c. Apply an approved caulking material between aluminum and dissimilar metal.
15. Paint aluminum in contact with or built into mortar, concrete, plaster, or other masonry materials with a coat of bituminous paint.
16. Paint aluminum in contact with absorptive materials that may become repeatedly wet with two coats of bituminous paint or two coats of aluminum paint.
17. Bitumen Stops:
    a. Install bitumen stops for built-up roof opening penetrations through deck and at formed sheet metal gravel stops.
    b. Nail leg of bitumen stop at 300 mm (12 inch) intervals to nailing strip at roof edge before roofing material is installed.

3.02 COPINGS

A. General:
    1. On walls topped with a wood plank, install a continuous edge strip on the front and rear edge of the plank. Lock the coping to the edge strip with a 19 mm (3/4 inch) loose lock seam.
    2. Where shown turn down roof side of coping and extend down over base flashing as specified for counter-flashing. Secure counter-flashing to lock strip in coping at continuous cleat.
    3. Install ends adjoining existing construction so as to form space for installation of sealants. Sealant is specified in Section 07 92 00, JOINT SEALANTS.
B. Aluminum Coping:
    1. Install with 6 mm (1/4 inch) joint between ends of coping sections.
    2. Install joint covers, centered at each joint, and securely lock in place.

3.03 EXPANSION JOINT COVERS, INSULATED

A. Install insulated expansion joint covers at locations shown on curbs not less than 200 mm (8 inch) high above roof surface.

B. Install continuous edge strips of same metal as expansion joint flange, nailed at not less than 75 mm (3 inch) centers.

C. Install insulated expansion joint covers in accordance with manufacturer's directions locking edges to edge strips.

END OF SECTION

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 07 71 00

ROOF SPECIALTIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section specifies equipment supports.

1.02 RELATED WORK

A. Sealant material and installation: Section 07 92 00, JOINT SEALANTS.
B. General insulation: Section 07 22 00, ROOF AND DECK INSULATION.
C. Railing and Guard Rail Fabrication: 05 50 00, METAL FABRICATIONS.

1.03 QUALITY CONTROL

A. All roof accessories shall be the products of manufacturers regularly engaged in producing the kinds of products specified.
B. Each accessory type shall be the same and be made by the same manufacturer.
C. Each accessory shall be completely assembled to the greatest extent possible before delivery to the site.

1.04 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Samples: Representative sample panel of color anodized aluminum not less than 100 mm X 100 mm (four by four inches), except extrusions shall be a width not less than section to be used. Sample shall show coating with integral color and texture and shall include manufacturer's identifying label.
C. Shop Drawings: Each item specified showing design, details of construction, installation and fastenings.
D. Manufacturer's Literature and Data: Each item specified.
E. Certificates: Stating that aluminum has been given specified thickness of anodizing.

1.05 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extend referenced. The publications are referenced in the text by the basic designation only.
B. Federal Specifications (Fed. Spec.):
   1. RR-G-1602D Grating, Metal, Other Than Bar Type (Floor, Except for Naval Vessels)
C. American Society for Testing and Material (ASTM):

1. A653/A653M-10 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) By the Hot-Dip Process
2. B209/209M-07 Aluminum and Aluminum Alloy-Sheet and Plate
3. B221/221M-08 Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
4. C612-10 Mineral Fiber Block and Board Thermal Insulation
5. D1187-97(R2002) Asphalt-Base Emulsions for Use as Protective Coatings for Metal

D. National Association of Architectural Metal Manufacturers (NAAMM):
1. AMP 500 Series Metal Finishes Manual

E. American Architectural Manufacturers Association (AAMA):
1. 2605-11 High Performance Organic Coatings on Architectural Extrusions and Panels.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aluminum, Extruded: ASTM B221/B221M.
B. Aluminum Sheet: ASTM B209/B209M.
C. Galvanized Sheet Steel: ASTM A526/A526M; G-90 coating.

2.02 EQUIPMENT SUPPORTS

A. Fabricate equipment supports from 1.3 mm (0.0516 inch) thick galvanized steel.
B. Form exterior curb with integral base.
C. Use galvanized steel liners for curbs having inside dimension over 305 mm (12 inches).
D. Fabricate curb with a minimum height of 200 mm (8 inches) above roof surface.
E. Attach preservative treated wood nailers to top of curb. Use 50 mm (2 inch) by 50 mm (2 inch) minimum nominal size on curb with openings and 50 mm (2 inch) thick, width of curb up to 300 mm (12 inches) on equipment support curbs.
F. Make size of supports suit size of equipment furnished, with height as shown on drawings, but not less than 200 mm (8 inches) above roof surface or as required by roofing manufacturer, whichever is greater.

2.03 ROOF EDGE PROTECTION

A. Acceptable Manufacturers: Kee Safety, Inc.; 100 Stradtman St., Buffalo, NY 14206; Toll Free Tel: 800-851-5181; Tel: 716-896-4949; Fax: 716-896-5696; Web: www.keeklamp.com, or approved equal.
1. Roof Edge Protection: Provide roof edge protection system consisting of pipe, fittings, and accessories to provide a complete railing system including top rail, mid rail and posts.
a. Fittings (elbows, crossovers, tees, couplings, etc.): Aluminum alloy; high grade aluminum silicon magnesium alloy.
b. Pipe (rails and posts): Aluminum pipe 1-1/2 inches.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install roof specialties where shown.
B. Secure with fasteners in accordance with manufacture's printed installation instructions and approved shop drawings unless shown otherwise.
C. Coordinate to install insulation where shown; see Section 07 22 00, ROOF AND DECK INSULATION.
D. Comply with section 07 92 00, JOINT SEALANTS to install sealants where manufactures installation instructions require sealant.
E. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.
   1. After completion of base flashing bend down cap flashing flange and secure to blocking with screws.
   2. Install expansion joint cover with 6 mm (1/4 inch) wide space at end joints and tension bars at 600 mm (24 inches) on center.
   3. Install cover plates with formed aluminum flashing concealed and centered on joint. Flashing to lap cover not less than 100 mm (4 inches).
F. Equipment Supports: Do not anchor to insulating concrete or metal deck. Anchor only to building structure as per manufacturers recommendations.

3.02 PROTECTION OF ALUMINUM

A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with two coats of asphalt coating (complete coverage), or by separating the contact surfaces with a preformed neoprene tape having pressure sensitive adhesive coating on side.
B. Paint aluminum in contact with wood, concrete and masonry, or other absorptive materials, that may become repeatedly wet, with two coats of asphalt coating.

3.03 PROTECTION

A. Protect roof accessories from damage during installation and after completion of the work from subsequent construction.

END OF SECTION

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 07 92 00

MASONRY SEALANTS AND CAULKING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Furnish all labor, materials, tools and equipment and perform all Work necessary for and incidental to providing sealants and caulking as shown on the Drawings and specified herein; in accordance with the provisions of the Contract

B. Work of this Section shall include:
   1. Sealant below new through wall flashing.
   2. Sealant at flashing splice joints.
   3. Sealant required at all existing sealant joints in the brick masonry between two colors of the brick masonry
   4. Sealant at any expansion joints
   5. Sealant at perimeter of newly installed or reinstalled windows
   6. All other sealant Work.

C. Related requirements specified elsewhere:
   1. Section 02 41 10 - Selective Demolition
   2. Section 04 20 00 - Brick Masonry
   3. Section 07 60 00 - Flashing and Sheet Metal.

1.02 QUALITY ASSURANCE

A. Qualifications:
   1. Contractor must have a minimum of five (5) years of experience in installation of caulking and sealants.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 53 23:
   1. Manufacturer's Literature: Materials description and installation instructions for each compound and filler.
   2. Samples: Samples of each compound, filler and backing

1.04 PRODUCT DELIVERY, HANDLING AND STORAGE

A. All materials shall be delivered to the job site in manufacturer's sealed packaging and stored in an enclosed shelter providing protection from damage and exposure to the elements. Damaged or deteriorated materials shall be removed from the premises.

B. Store and condition the specified products as recommended by the product manufacturer.

1.05 JOB CONDITIONS

A. Environmental Conditions: Do not apply sealant if precipitation appears imminent.

B. Temperature: Do not apply sealant when the air temperature is below 40° F. See Paragraph 3.02.A.1 of this section.

C. Protection: Precautions should be taken to avoid damage to any surface near the work zone due to the mixing and handling of the sealant.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Sealant for joints where masonry or concrete is the substrate on both sides of joint: One Part Polyurethane, Nonsag, (± 25% Movement): "Dymonic" (Tremco), "Sonolastic NP1" (Sonneborn). Color to be selected by Owner.

B. Sealant for joints with metal and/or glass substrates or at counterflashing in conjunction with through wall flashings repairs: One part Silicone, Nonsag (± 50% movement) Dow 790 Color to be selected by Owner.

C. Sealant for concealed metal lap joints: Butyl sealant as specified in Section 07 60 00.

D. Joint Backer Rod: Type recommended by the manufacturer of the sealing or caulking compound for the specific joint surface and conditions with configuration as shown on Drawings.

E. Joint Cleaner: Type recommended by the manufacturer of the sealing or caulking compound for the specific joint surface and conditions. If Primer is not used, Contractor must submit to the Owner a letter from the sealant manufacturer stating that it is not required in this application.

F. Joint Primer and Sealer: Type recommended by the manufacturer of the sealing or caulking compound for the specific joint surface and conditions.

G. Bond Breaker: Type recommended by the manufacturer of the sealing or caulking compound for the specific joint surface and conditions.

PART 3 - EXECUTION

3.01 PREPARATION

A. Manufacturer’s representative for each sealant used on the project is to review the project documents for appropriateness of their products. Prior to purchasing the material, Contractor is to submit a letter from each manufacturer stating that their product is appropriate for this use and providing their recommendations for the surface preparation and installation procedures for review by the Licensed Engineer.

B. Select only sealing compounds of manufacturers who agree to have a qualified representative visit the site at the beginning of the joint sealing work and periodically thereafter as necessary to ensure the proper installation of the sealing compounds.

C. Examine all surfaces to receive the parts of the Work specified herein. All surfaces must be clean, dry, sound and free of frost. At all times, follow the manufacturer's recommendations. Application or installation of material constitutes acceptance of the substrate.

D. Clean surfaces and remove all sealant and protective coatings, which might fail in adhesion or interfere with bond of compound, so that surfaces are free of deleterious substances which might impair the Work. Except as otherwise approved by the manufacturer, elastomeric sealants shall not be applied to joint surfaces previously treated with paint, lacquer, sealer, curing compound, water repellent or other coatings unless such coatings have been entirely removed.

E. Prime surfaces in accordance with the instructions of the sealant manufacturer. If manufacturer does not recommend primer, contractor must submit a letter from the manufacturer stating that it is not required on this building before any sealant is installed.

F. Install bond breakers in locations and of type recommended by the sealant manufacturer to prevent bond of sealant to surfaces where such bond might impair the performance of the sealant.

3.02 INSTALLATION

A. Install all materials in accordance with the manufacturer's printed instructions. Unless otherwise directed, conform with the following:
   1. Compounds shall not be installed below a temperature of 40° F unless approved in writing by Licensed Engineer.
   2. Confine compounds to joint areas shown. Use masking tape to prevent staining of adjoining surfaces or spillage and migration of compound out of the joints. Tool surface to shape shown or, if none is shown, to flush or slightly concave surface.
   3. Use power driven equipment wherever possible to install compounds so as to ensure uniformity of application and the highest quality of workmanship.
   4. Daily records will be maintained by Contractor where exterior sealant applications have been made.

3.03 FIELD QUALIFICATION TEST

A. Perform trial sealant applications for all substrates in trial areas selected by the Owner’s Representative prior to complete mobilization for review to determine the adhesive strength of the sealant and any necessary revisions to sealant application procedures. Sealant supplier is to be present. Only based upon successful test results can further activity proceed. The initial sealant application in the trial test area shall be made in accordance with written instructions from the sealant manufacturer indicating cleaning, priming and application procedures. These written

instructions should be based upon wet and dry laboratory adhesion in peel tests. After an appropriate cure period, a field adhesion test is to be performed as indicated below.

B. As a check for adhesion, a hand pull test shall be conducted in the trial test area after the sealant is fully cured (usually within 14 to 21 days). The test shall be performed in accordance with the following procedure. The procedure describes a test on a vertical joint.
   1. Make a knife cut horizontally from one side of the joint to the other.
   2. Make two vertical cuts approximately 2 in. long at the sides of the joint meeting the horizontal cut at the top of the 2 in. cuts.
   3. Grasp the 2 in. piece of sealant firmly between fingers and pull down at a 90 degree angle or more and try to pull the uncut sealant out of the joint.
   4. If adhesion is proper, the sealant should tear cohesively (within itself) before releasing from the substrate.
   5. Areas experiencing failures will be examined and these areas will have the existing sealant removed and then the surfaces recleaned, primed and reapply sealant.

C. Sealant must be replaced in test area by cleaning, priming and then applying more sealant in the same manner as was originally installed (assuming good adhesion was obtained). Care should be taken to assure that the new sealant is in contact with the original and that the original sealant surfaces are clean and primed so that good bond between the new and old sealant will be obtained. Check with sealant manufacturers for proper techniques for repair areas.

D. Test areas will be selected by Owner's Representative. Areas experiencing failure will have all material removed and resealed as necessary to assure good adhesive bond of the sealant.

3.04 CLEAN UP

A. As Work progresses remove excess compound and clean adjoining surfaces as may be required to eliminate any indication or soiling or migration.

B. At the conclusion of sealing and caulking work remove all scaffolding and equipment used in the Work, clean up all debris and surplus material and remove same from the premises.

END OF SECTION

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 07 92 10

ROOFING JOINT SEALANTS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Section covers all sealant and caulking materials and their application, wherever required for complete installation of building materials or systems.

1.02 QUALITY CONTROL:

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.
    1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.
    2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.
    3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.
    4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
D. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates in accordance with sealant manufacturer's recommendations:
    1. Locate test joints where indicated or, if not indicated, as directed by Contracting Officer.
    2. Conduct field tests for each application indicated below:
        a. Each type of elastomeric sealant and joint substrate indicated.
        b. Each type of non-elastomeric sealant and joint substrate indicated.
    3. Notify Resident Engineer seven days in advance of dates and times when test joints will be erected.
    4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
E. VOC: Acrylic latex and Silicon sealants shall have less than 50g/l VOC content.

1.03 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's installation instructions for each product used.
C. Cured samples of exposed sealants for each color where required to match adjacent material.
D. Manufacturer's Literature and Data:
   1. Caulking compound
   2. Primers
   3. Sealing compound, each type, including compatibility when different sealants are in contact with each other.

1.04 PROJECT CONDITIONS:

A. Environmental Limitations:
   1. Do not proceed with installation of joint sealants under following conditions:
      a. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 □C (40 □F).
      b. When joint substrates are wet.
B. Joint-Width Conditions:
   1. Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
C. Joint-Substrate Conditions:
   1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.05 DELIVERY, HANDLING, AND STORAGE:

A. Deliver materials in manufacturers' original unopened containers, with brand names, date of manufacture, shelf life, and material designation clearly marked thereon.
B. Carefully handle and store to prevent inclusion of foreign materials.
C. Do not subject to sustained temperatures exceeding 32 □ C (90□F) or less than 5□C (40□F).

1.06 DEFINITIONS:

A. Definitions of terms in accordance with ASTM C717 and as specified.
B. Back up Rod: A type of sealant backing.
C. Bond Breakers: A type of sealant backing.
D. Filler: A sealant backing used behind a back-up rod.

1.07 WARRANTY:

A. Warranty exterior sealing against leaks, adhesion, and cohesive failure, and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period shall be extended to two years.
B. General Warranty: Special warranty specified in this Article shall not deprive Government of other rights Government may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

1.08 APPLICABLE PUBLICATIONS:

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.

B. American Society for Testing and Materials (ASTM):
   1. C509-06 Elastomeric Cellular Preformed Gasket and Sealing Material.
   2. C612-10 Mineral Fiber Block and Board Thermal Insulation.
   3. C717-10 Standard Terminology of Building Seals and Sealants.
   4. C834-10 Latex Sealants.
   5. C919-08. Use of Sealants in Acoustical Applications.
   6. C920-10 Elastomeric Joint Sealants.
   7. C1021-08 Laboratories Engaged in Testing of Building Sealants.
   8. C1193-09 Standard Guide for Use of Joint Sealants.
   9. C1330-02 (R2007) Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
   10. D1056-07 Specification for Flexible Cellular Materials—Sponge or Expanded Rubber.
   11. E84-09 Surface Burning Characteristics of Building Materials.

C. Sealant, Waterproofing and Restoration Institute (SWRI).
   1. The Professionals' Guide

PART 2 - PRODUCTS

2.01 SEALANTS

A. S-1:
   1. ASTM C920, polyurethane or polysulfide.
   2. Type M.
   3. Class 25.
   4. Grade NS.
   5. Shore A hardness of 20-40

B. S-2:
   1. ASTM C920, polyurethane or polysulfide.
   2. Type M.
   3. Class 25.
   4. Grade P.
   5. Shore A hardness of 25-40.

C. S 3:
   1. ASTM C920, polyurethane or polysulfide.
   2. Type S.
   3. Class 25, joint movement range of plus or minus 50 percent.
   4. Grade NS.
   5. Shore A hardness of 15-25.
   6. Minimum elongation of 700 percent.

D. S-4:
   1. ASTM C920 polyurethane or polysulfide.

2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-40.

E. S-5:
1. ASTM C920, polyurethane or polysulfide.
2. Type S.
3. Class 25.
4. Grade P.
5. Shore hardness of 15-45.

F. S-6:
1. ASTM C920, silicone, neutral cure.
2. Type S.
3. Class: Joint movement range of plus 100 percent to minus 50 percent.
4. Grade NS.
5. Shore A hardness of 15-20.
6. Minimum elongation of 1200 percent.

G. S-7:
1. ASTM C920, silicone, neutral cure.
2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-30.
6. Structural glazing application.

H. S-8:
1. ASTM C920, silicone, acetoxy cure.
2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-30.
6. Structural glazing application.

I. S-9:
1. ASTM C920 silicone.
2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-30.
6. Non-yellowing, mildew resistant.

J. S-10:
1. ASTMC C920, coal tar extended fuel resistance polyurethane.
2. Type M/S.
3. Class 25.
4. Grade P/NS.
5. Shore A hardness of 15-20.

K. S-11:
   1. ASTM C920 polyurethane.
   2. Type M/S.
   3. Class 25.
   4. Grade P/NS.
   5. Shore A hardness of 35 to 50.

L. S-12:
   1. ASTM C920, polyurethane.
   2. Type M/S.
   3. Class 25, joint movement range of plus or minus 50 percent.
   4. Grade P/NS.
   5. Shore A hardness of 25 to 50.

2.02 COLOR:

A. Sealants used with exposed masonry shall match color of mortar joints.
B. Sealants used with unpainted concrete shall match color of adjacent concrete.
C. Color of sealants for other locations shall be light gray or aluminum, unless specified otherwise.

2.03 JOINT SEALANT BACKING:

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
B. Cylindrical Sealant Backings: ASTM C1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
   1. Type C: Closed-cell material with a surface skin.
C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 32□ C (minus 26□F). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.04 FILLER:

A. Mineral fiber board: ASTM C612, Class 1.
B. Thickness same as joint width.
C. Depth to fill void completely behind back-up rod.

2.05 PRIMER:

A. As recommended by manufacturer of caulking or sealant material.
B. Stain free type.

2.06 CLEANERS - NON PORROUS SURFACES:

A. Chemical cleaners acceptable to manufacturer of sealants and sealant backing material, free of oily residues and other substances capable of staining or harming joint substrates and adjacent non-porous surfaces and formulated to promote adhesion of sealant and substrates.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Inspect substrate surface for bond breaker contamination and unsound materials at adherent faces of sealant.
B. Coordinate for repair and resolution of unsound substrate materials.
C. Inspect for uniform joint widths and that dimensions are within tolerance established by sealant manufacturer.

3.02 PREPARATIONS:

A. Prepare joints in accordance with manufacturer's instructions and SWRI.
B. Clean surfaces of joint to receive caulking or sealants leaving joint dry to the touch, free from frost, moisture, grease, oil, wax, lacquer paint, or other foreign matter that would tend to destroy or impair adhesion.
    1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
    2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
        a. Concrete.
        b. Masonry.
        c. Unglazed surfaces of ceramic tile.
    3. Remove laitance and form-release agents from concrete.
    4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
        a. Metal.
        b. Glass.
        c. Porcelain enamel.
        d. Glazed surfaces of ceramic tile.
C. Do not cut or damage joint edges.
D. Apply masking tape to face of surfaces adjacent to joints before applying primers, caulking, or sealing compounds.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

E. Apply primer to sides of joints wherever required by compound manufacturer's printed instructions.
1. Apply primer prior to installation of back-up rod or bond breaker tape.
2. Use brush or other approved means that will reach all parts of joints.

F. Take all necessary steps to prevent three sided adhesion of sealants.

3.03 BACKING INSTALLATION:

A. Install back-up material, to form joints enclosed on three sides as required for specified depth of sealant.

B. Where deep joints occur, install filler to fill space behind the back-up rod and position the rod at proper depth.

C. Cut fillers installed by others to proper depth for installation of back-up rod and sealants.

D. Install back-up rod, without puncturing the material, to a uniform depth, within plus or minus 3 mm (1/8 inch) for sealant depths specified.

E. Where space for back-up rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.

F. Take all necessary steps to prevent three sided adhesion of sealants.

3.04 SEALANT DEPTHS AND GEOMETRY:

A. At widths up to 6 mm (1/4 inch), sealant depth equal to width.

B. At widths over 6 mm (1/4 inch), sealant depth 1/2 of width up to 13 mm (1/2 inch) maximum depth at center of joint with sealant thickness at center of joint approximately 1/2 of depth at adhesion surface.

3.05 INSTALLATION:

A. General:
1. Apply sealants and caulking only when ambient temperature is between 5□ C and 38□C (40□ and 100□ F).
2. Do not use polysulfide base sealants where sealant may be exposed to fumes from bituminous materials, or where water vapor in continuous contact with cementitious materials may be present.
3. Do not use sealant type listed by manufacture as not suitable for use in locations specified.
4. Apply caulking and sealing compound in accordance with manufacturer's printed instructions.
5. Avoid dropping or smearing compound on adjacent surfaces.
6. Fill joints solidly with compound and finish compound smooth.
7. Tool joints to concave surface unless shown or specified otherwise.
8. Finish paving or floor joints flush unless joint is otherwise detailed.
9. Apply compounds with nozzle size to fit joint width.
10. Test sealants for compatibility with each other and substrate. Use only compatible sealant.

B. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise.

C. Where gypsum board partitions are of sound rated, fire rated, or smoke barrier construction, follow requirements of ASTM C919 only to seal all cut-outs and intersections with the adjoining construction unless specified otherwise.

1. Apply a 6 mm (1/4 inch) minimum bead of sealant each side of runners (tracks), including those used at partition intersections with dissimilar wall construction.
2. Coordinate with application of gypsum board to install sealant immediately prior to application of gypsum board.
3. Partition intersections: Seal edges of face layer of gypsum board abutting intersecting partitions, before taping and finishing or application of veneer plaster-joint reinforcing.
4. Openings: Apply a 6 mm (1/4 inch) bead of sealant around all cut-outs to seal openings of electrical boxes, ducts, pipes and similar penetrations. To seal electrical boxes, seal sides and backs.
5. Control Joints: Before control joints are installed, apply sealant in back of control joint to reduce flanking path for sound through control joint.

3.06 FIELD QUALITY CONTROL:

A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates as recommended by sealant manufacturer:

1. Extent of Testing: Test completed elastomeric sealant joints as follows:
   a. Perform 10 tests for first 300 m (1000 feet) of joint length for each type of elastomeric sealant and joint substrate.
   b. Perform one test for each 300 m (1000 feet) of joint length thereafter or one test per each floor per elevation.

B. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.

C. Inspect tested joints and report on following:

1. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
2. Compare these results to determine if adhesion passes sealant manufacturer’s field-adhesion hand-pull test criteria.
3. Whether sealants filled joint cavities and are free from voids.
4. Whether sealant dimensions and configurations comply with specified requirements.

D. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

E. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.

F. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements, will be considered satisfactory. Remove sealants

that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.07 CLEANING:

A. Fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by the caulking or sealant manufacturer.
B. After filling and finishing joints, remove masking tape.
C. Leave adjacent surfaces in a clean and unstained condition.

3.08 LOCATIONS:

A. Exterior Building Joints, Horizontal and Vertical:
   1. Metal to Metal: Type S-1, S-2
   2. Metal to Masonry or Stone: Type S-1
   3. Masonry to Masonry or Stone: Type S-1
   4. Stone to Stone: Type S-1
   5. Threshold Setting Bed: Type S-1, S-3, S-4
   6. Masonry Expansion and Control Joints: Type S-6
B. Metal Reglets and Flashings:
   1. Flashings to Wall: Type S-6
   2. Metal to Metal: Type S-6
C. Sanitary Joints:
   1. Pipe Penetrations: Type S-9
D. High Temperature Joints over 204 degrees C (400 degrees F):
   1. Exhaust Pipes, Flues, Breech Stacks: Type S-7 or S-8

END OF SECTION

SECTION 26 41 00

FACILITY LIGHTNING PROTECTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section specifies the furnishing and installation of a complete master labeled lightning protection system, complying with NFPA 780, UL 96 and UL 96A.

1.02 RELATED WORK

A. Section 07 60 00, FLASHING AND SHEET METAL: penetrations through the roof.

1.03 QUALITY ASSURANCE

A. Refer to Paragraph, QUALIFICATIONS, in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.04 SUBMITTALS

A. In the event that lightning protection has to be replaced submit the following:

B. Shop Drawings:

1. Isometric and plan views showing layout and connections to the required metal surfaces.

2. Show the methods of mounting the system to the adjacent construction.

C. Qualifications: Submit proof that the installer of the lightning protection system is a certified Lighting Protection Institute (LPI) installer, and has had suitable and adequate experience installing other lightning protection systems, and is capable of installing the system as recommended by the manufacturer of the equipment.

D. Certification: Two weeks prior to final inspection, submit four copies of the following certifications to the Resident Engineer:

1. Certification that the lightning protection system has been properly installed and tested.

2. Certification that the lightning protection system has been inspected by a UL representative and has been approved by UL without variation.

1.05 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. National Fire Protection Association (NFPA):

1. 70.....National Electrical Code (NEC)

2. 780.....Standard for the Installation of Lightning Protection Systems

C. Underwriters Laboratories, Inc. (UL):

1. 96.....Lightning Protection Components

2. 96A.....Installation Requirements for Lightning Protection Systems

3. UL 467 .....Standard for Grounding and Bonding Equipment

PART 2 - PRODUCTS

2.01 MATERIALS

A. Attach master labels to each item by its manufacturer as evidence that the materials have been manufactured in conformance with the UL Standards for master label lightning protection materials.

B. In additional to conformance to UL 96, the component material requirements are as follows:

1. Conductors: Electrical grade copper. Conductors shall be in accordance with NFPA 780 and UL 96 for Class I, Class II, or Class II modified materials as applicable.

2. Air terminals: Solid copper, 18 inches long, not less than 3/8 inch [9mm] diameter, with sharp nickel-plated points.

3. Ground rods: solid copper, not less than 1/2 inch [13mm] diameter by 8 feet [2400mm] long. Rods made of copper-clad steel shall conform to UL 467 and galvanized ferrous rods shall conform to IEEE C135.30. Ground rods of copper-clad steel, steel, stainless steel, galvanized ferrous and solid copper shall not be mixed on the project.

4. Ground plates: Solid copper, not less than 1/16 inch [2mm] thick.

5. Tubing: Stiff copper or brass.

C. Anchors and fasteners: Bolt types which are most suitable for the specific anchor and fastener installations. Clamp-type connectors for splicing conductors shall conform to UL 96, class as applicable, and, Class 2, style and size as required for the installation. Clamp-type connectors shall only be used for the connection of the roof conductor to the air terminal and to the guttering. All other connections, bonds, and splices shall be done by exothermic welds or by high compression fittings. The exothermic welds and high compression fittings shall be listed for the purpose. The high compression fittings shall be the type which requires a hydraulically operated mechanism to apply a minimum of 10,000 psi.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation shall be coordinated with the roofing manufacturer and installer.

B. Install the conductors as inconspicuously as practical and with the proper bends.

C. Install the vertical conductors within the concealed cavity of exterior walls. Run the conductors to the exterior at elevations below the finished grade and make the ground connections to the earth outside of the building or stack perimeter.

D. Make connections of dissimilar metal with bimetallic type fittings to prevent electrolytic action.

E. Use the exothermic welding type connections that form solid metal joints in the main vertical and horizontal conductors, and for connections that are not exposed in the finish work.

F. Protect copper conductors with stiff copper or brass tubing, which enclose the conductors from the top to the bottom of the tubing, between one foot [300mm] below and seven feet [2100mm] above the finished grade. The conductor shall be bonded to the top and bottom of the tubing.

G. Sheath copper conductors, which pass over cast stone, cut stone, architectural concrete and masonry surfaces, with not less than a 1/16 inch [2mm] thickness of lead to prevent staining of the exterior finish surfaces.

H. For the earth connections, install ground rods and ground plates, and the conductor connections to them and the main water pipes in the presence of the Resident Engineer. For the conductors located outside of the building or stack, install the conductors not less than two feet [600mm] below the finished grade.

I. For structural steel buildings, connect the steel framework of the buildings to the main water pipe near the water system entrance to the building.

J. Connect lightning protection cables to all metallic projections, equipment, and components above the roof as indicated on the drawings.

K. Connect exterior metal surfaces, located within three feet [900mm] of the lightning protection system conductors, to the lightning protection system conductors to prevent flashovers.

L. Maintain horizontal or downward coursing of main conductor and insure that all bends have at least an 8-inch radius and do not exceed 90 degrees.

M. Conductors shall be rigidly fastened every three feet [900mm] along the roof and down to the building to ground.

N. Air terminals shall be secured against overturning either by attachment to the object to be protected or by means of a substantial tripod or other braces permanently and rigidly attached to the building or structure. Install air terminal bases, cable holders and other roof-system supporting means without piercing roof metal.

O. Use clamp supports to secure supporting means to roof standing seams only.

P. Use through-roof connectors for down-conductor attachment to roof system. Provide flashing in accordance with Section 07 60 00, FLASHING AND SHEET METAL.

Q. Down-conductors coursed on or in reinforced concrete columns or on structural steel columns shall be connected to the reinforcing steel or the structural steel member at its upper and lower extremities. In the case of long vertical members an additional connection shall be made at intervals not exceeding 100 feet [30m].

R. A counterpoise, where shown, shall be of No. 1/0 copper cable or equivalent material having suitable resistance to corrosion and shall be laid around the perimeter of the structure in a trench not less than 2 feet [600mm] deep at a distance not less than 3 feet [900mm] nor more than 8 feet [2.5m] from the nearest point of the structure.

S. On construction utilizing post tensioning systems to secure precast concrete sections, the post tension rods shall not be used as a path for lightning to ground. Down conductors shall be provided on structures using post tensioning systems. Down conductors shall have sufficient separation from post tension rods to prevent side-flashing. Post tension rods shall be bonded to the lightning protection and grounding systems only at the base of the structure; this bonding shall be performed in strict accordance with the recommendations of the post tension rod manufacturer, and shall be done by, or in the presence of, a representative of the manufacturer.

T. Grounding: Test the ground resistance to earth by standard methods and conform to the ground resistance requirements.

U. Where shown, use the structural steel framework or reinforcing steel as the main conductor:

1. Weld or bond the non-electrically-continuous sections together and make them electrically continuous.

2. Verify the electrical continuity by measuring the ground resistances to earth at the ground level, at the top of the building or stack, and at intermediate points with a sensitive ohmmeter. Compare the resistance readings.

3. Connect the air terminals together with an exterior conductor connected to the structural steel framework at not more than 60 foot [18m] intervals.

4. Install ground connections to earth at not more than 60 foot [18m] intervals around the perimeter of the building.

5. Weld or braze bonding plates, not less than 8 inches [200mm] square, to cleaned sections of the steel and connect the conductors to the plates.

6. Do not pierce the structural steel in any manner. Connections to the structural steel shall conform to UL Publication No. 96A.

V. For smoke stacks, the following additional requirements shall apply:

1. Extend air terminals from approximately three feet [900mm] below the top of the smoke stacks to approximately three feet [900mm] above the top of the stacks.

2. Securely seat and rivet the vertical conductors into bronze cable connectors. Cross-connect the vertical conductors at approximately the midpoint between the top and bottom of the smoke stacks.

W. For obstruction lights, the following additional requirements shall apply:

1. Extend air terminals one foot [300mm] above the top of the light fixtures and securely clamp to the light fixture supports.

2. Install 600 volt class lightning arresters. Connect the arresters to the lightning circuit conductors at suitable locations, and ground and bond them to the lightning protection system.

X. When the lightning protection systems have been installed, have the systems inspected by a UL representative. Obtain and install a UL numbered master label for each of the lightning protection systems at the location directed by the UL representative and the Resident Engineer.

Y. Where the drawings show the new lightning protection system connected to an existing lightning protection system without a UL master label, the new portion of the lightning system still requires inspection and labels as specified above for new work.

Z. Metal fences that are electrically continuous with metal posts extending at least 2 feet [600mm] into the ground require no additional grounding. Other fences shall be grounded on each side of every gate. Fences shall be grounded by means of ground rods every 1000 to 1500 feet [300 to 450m] of length when fences are located in isolated places, and every 500 to 750 feet [150 to 225m] when in proximity (100 feet [30m] or less) to public roads, highways, and buildings.

END OF SECTION